

LIQUID CRYSTAL DISPLAY PRODUCTS

Representing Electronic Components
<http://www.csc-intl.com>

ANADIAN SOURCE CORPORATION

Winnipeg

Tel: (204) 897-4401
Fax: (204) 897-3181

Toronto Head Office

Tel: (905) 415-1951
Fax: (905) 415-1953

Montreal

Tel: (514) 457-5556
Fax: (514) 457-5096

Ottawa

Tel: (613) 592-5641
Fax: (905) 415-1953

Calgary

Tel: (403) 720-7922
Fax: (403) 720-2932

Vancouver

Tel: (604) 687-5285
Fax: (604) 687-5295

Across Canada 1-800-665-6013

Standish LCD
Division of Standish Industries, Inc.



Standish Industries' commitment to excellence encompasses all aspects of the organization: Products and Service, Product Reliability, On-time Delivery, Worldwide Competitive Pricing, and a leadership role in LCD Technology. Dedicated attention to detail in these collective disciplines has earned Standish Industries the reputation of a world class LCD manufacturer.



service of its Liquid Crystal Display products.

Our exclusive focus is on Liquid Crystal Display technology and manufacturing excellence and to provide our customers with the benefits of that commitment.

Corporate headquarters is pictured.

A History of Liquid Crystal Display Innovations and Involvement:

1972 – Introduction of our first product, a dynamic scattering liquid crystal display (LCD).

1973 – The LCD Division of Hamlin, Inc. was formed and began production of twisted nematic (TN) LCDs.

1977 – "Outdoor" type LCDs developed after extensive research in glass, fluids, polarizer and seal material properties.

1981 – Guest-host dichroic LCD products are added to the product line.

1982 – Multiplex LCDs added to the twisted nematic (TN) LCD product family.

1983 – The development of "color ink process" LCDs, various glass shapes (other than square or rectangular) and avionics process LCDs round out the product line.

1985 – LCD manufacturing converted from discrete to array processing.

1989 – Standish Industries purchases the LCD Division from Hamlin.

1989 – Standish Industries becomes the first North American LCD manufacturer to produce Supertwist (STN) LCDs.

1989 – A complete line of standard and custom LCD modules is introduced.

1990 – Standish Industries and Xerox jointly agree to investigate active matrix thin film transistor (AMTFT) LCDs.

1991 – STN operating range extended to -20 to +80° C.

A tradition of excellence.

1992 – Custom LCD module capabilities expanded to include complex graphic formats. Cold cathode fluorescent (CCF) backlight and touchscreen options added to custom module offering.

1993 – Major facility expansion completed allowing for a three-fold capacity increase and the manufacture of complex graphic STN LCDs with a pixel gap of 0.03 mm. Standish joins U.S. Display Consortium.

1994 – Chip-on-board (COB) technology developed for moderate volume custom LCD module applications. Enhanced STN (ESTN) technology introduced. Standard graphic module selection increased. CCF (cold cathode fluorescent) backlight option added to custom module product line. Strategic alliance signed with Motif, Inc. allowing Standish to purchase Active Addressing™ integrated circuits.

LCD Technology Involvement:

Each Standish technical LCD innovation enhances the use of previous developments and assures that your requirements are satisfied with the strongest base of LCD technology available. Our current technical capabilities include: Standard or custom TN or STN LCD glass or modules, plus involvement with AMTFT, FLC, Active Addressing™, and other light manipulating research.

LCD Manufacturing Capability:

Production quantities from 100 to 100,000 pieces, at competitive pricing, from a stable, growth oriented company that is totally committed to manufacturing excellence of standard and custom LCDs and modules.

World Class Company:

Standish is one of the global leaders in LCD technology, quality, sales, service and delivery support. Excellent support and world class quality are among the intangibles that make a product and a company superior.

OVERVIEW 2 History 3 Capability 4 Technologies 5 Static & Multiplex Drive Explanation	STANDARD LCDs 6 Operating 7-10 Static Drive LCDs 11-13 Multiplex Drive LCDs	LCD MODULES 14 Operating 15-19 Alphanumeric 20-23 Graphic
CUSTOM LCDs 24-25 Capabilities 26 TN Fluids 27 STN Fluids 28 Connection Methods 29 Design Sheet	CUSTOM LCD MODULES 30-31 Capabilities 32 Design Sheet	TECHNICAL REFERENCES 33 Available Data 34 Technology Preview 35 Definitions 36 Summary

™Motif, Inc.



Standish



A major part of Standish's 1993 facilities expansion included the addition of new production equipment and Class 100 clean rooms.

Standish has the capacity to produce large or small quantities of LCDs, satisfying orders ranging from 100 to 100,000 pieces. Many of the LCDs and LCD modules produced by Standish Industries are for custom or special applications, with short lead-time requirements. Standish has positioned their LCD manufacturing systems to satisfy this type of customer need.



Our ongoing commitment to technology allows selection from a broad range of production techniques to assure that the most cost-efficient and reliable LCD is supplied.

All Standish LCD manufacturing operations are performed in a vertically integrated facility to assure total control of quality and customer delivery requirements.

The first, and perhaps most critical process in the manufacture of a high quality liquid crystal display is development of extremely accurate display artwork. Artwork for all Standish LCDs is developed on our computer aided design system and the photographic masks are laser imaged for maximum possible accuracy.

This leading edge process provides prompt reaction to custom designs

and assures that we have the tight tolerance film masks that are critical for consistently superior LCDs.

Standish LCD production operations are performed in a "clean-room" environment by skilled, highly trained personnel, supported with the most modern equipment and systems available.

Total LCD capability.

The key to manufacturing high quality liquid crystal displays quickly and right the first time is to have absolute control of all processes employed. Processes are governed by our statistical process control system, from incoming materials to final inspection before shipment.

Our statistical control processes employ charting techniques such as $\bar{X}$, R to monitor process parameters and products. P Charts are used extensively outside the manufacturing areas and for problem solving. All equipment is calibrated to MIL STD 45662 to ensure proper control of all ongoing processes. Process capability studies are carried out on a continuing basis for all operations and equipment to assure consistent quality.

All new equipment purchases are statistically verified to assure that the equipment will perform to, or exceed, specified quality standards.

Ongoing reliability tests are run to monitor the results of process changes as well as to supply data on all current processes and materials. Parts in process are selected to go through environmental tests which last 504 hours with randomly selected parts run to end of life.



Our computer aided design center provides prompt, accurate development of custom or special LCDs.

Typical Environmental Testing* of Standish LCD Products

Temperature Tests	Commercial Grade	Industrial Grade
I. High Temperature Storage		
A. MIL STD 202E, Method 108A		
1. 70°C Test Condition A	X	X
2. 85°C Test Condition A		X
3. 100°C Test Condition A		X
B. Standish Test Methods		
1. 70°C 120 hrs.	X	X
2. 85°C 120 hrs.		X
II. Cold Temperature Storage		
A. Standish Test Methods		
1. SI -40°C 168 hrs.	X	X
2. SI -55°C 168 hrs.	X	X
III. Temp. Cycling, Thermal Shock		
A. MIL STD 202E		
1. Method 107D		
Test Condition A-1 (-55°C, 85°C)		
2. Method 102A		
Test Condition A-1 (5 cycles)	X	X
B. Standish Test Method		
1. -55°C to 85°C (25 cycles)	X	X
C. JEDEC 23 100°C (boiling water), 0°C (ice water)	X	X
IV. Humidity Storage		
A. MIL STD 202E		
1. Method 103B (40°C, 90%RH)	X	X
2. Test condition B (96 hrs)	X	X
3. Test Condition C (504 hrs)		X
B. Standish Test Methods		
1. 80°C 90%RH 120 hrs.		X
50°C 90%RH 120 hrs.	X	X
V. Heat Humidity Activated		
A. Standish Test Method		
1. 80°C 90%RH activated 5 volt sq. wave 120 hrs.	X	X
MTTF @80°C 90%RH activated 5 volt Square wave, no polarizer= 22,700 hrs		
MTTF @110°C, no polarizer+ 72,000 hrs		

Note: Displays tested with polarizer unless noted.

*Source: Standish Reliability lab

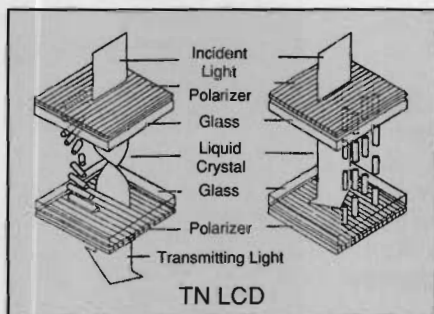


There are two basic LCD technologies employed by Standish Industries: twisted nematic and supertwist. Standish is also involved in active matrix LCD research. Following is a brief explanation of each technology.

Twisted Nematic (TN) LCDs

The basic twisted nematic LCD consists of a layer of liquid crystal material supported by two glass plates. The liquid crystal material is a mixture of long, cylindrically shaped molecules with different electrical and optical properties, depending on direction.

On the inner surfaces of the glass plates are transparent electrodes, which are patterned to form the desired visual image. The inner surfaces are coated with a polymer, which is



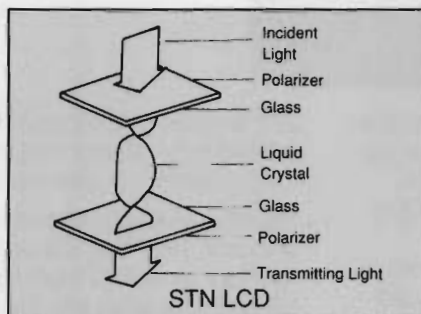
rubbed so that the liquid crystal material at one surface lies perpendicular to the other. Across the film of liquid crystal, the molecules form a 90-degree twist.

On the outer surface of the glass plates, polarizers are placed so they are parallel to the liquid crystal orientation and perpendicular to each other. In the "off" state, light entering the first polarizer is guided by the liquid crystal layer twist to the second polarizer, through which it is transmitted. When the cell is energized, the LC material is aligned with the electric field; light transmitted through the first polarizer is blocked by the second polarizer, forming a dark image. The effect may be reversed if the polarizers are placed parallel to each other, and a light image on a dark background is formed.

Supertwist (STN) LCDs

Although twisted nematic LCDs may be driven in a time multiplexed fashion to increase the amount of information displayed, they are restricted in terms of reduced contrast and

limited viewing angle. To achieve more highly multiplexed displays, supertwist technology is employed. In this type of display, the LC material undergoes a greater than 90-degree twist from plate to plate; typical values range from 180 to 270 degrees. The polarizers in this case are



not mounted parallel to the LC at the surface but rather at some angle. The cell, therefore, does not work on a light "guiding" principle, as in twisted nematic LCDs, but instead on a birefringence principle. The position of the polarizers, the cell thickness, and the birefringence of the LC are carefully chosen to result in a particular color in the "off" state. Usually, this is a yellow-green to maximize the contrast ratio. The LC in the cell is "supertwist-

ed" to give high multiplexability. As the twist is increased, the LC molecules in the middle of the layer are aligned with the applied electric field by smaller changes in voltage. This gives rise to a very steep transmission vs voltage curve, allowing up to 240-line multiplexing.

Active Matrix (AMTFT) LCDs

For displays of high information content, such as large dot matrix panels, the viewing angle and contrast problems of directly multiplexed displays would disappear if each element were directly addressable. Because of geometry and space limitations, this is not possible by electrode design. The active matrix approach addresses this problem by incorporating a switch at each picture element (pixel).

An active matrix display is constructed by building a grid of switching

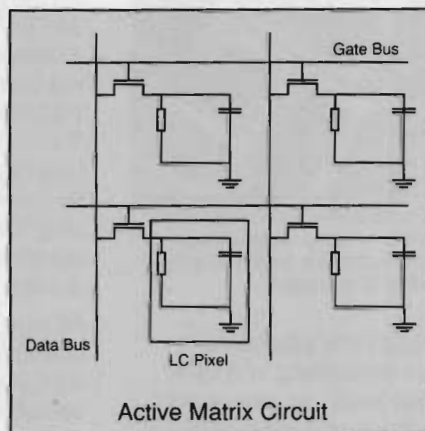
elements on the inside surface of the glass substrate. The switching elements may be two terminal devices, such as diodes, or three terminal devices, such as transistors. Each

display pixel has a switch located at the pixel. The switches/pixels are arranged in rows and columns, with the gates of each switch of one row tied together for connection to an external voltage source. The sources of each column of switches are also tied together for external addressing. When voltage is applied to a row of the matrix, the gates of that row allow data to be entered at the sources. The voltage at the source either turns the elements on or not. The voltage is then removed from that row, closing those switches, and the next row is addressed.

This cycle is applied to each row, then repeated, starting with the first row. Each pixel, therefore, is individually addressed.

The advantage to this method is that maximum contrast is achieved for the LC material, without increased viewing angle dependence. Also, voltages which only partially turn on the

pixels may be used to achieve grey scale effects.



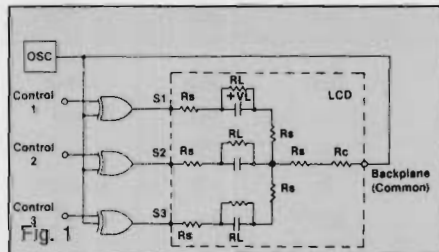
LCD Drive Considerations

Standish



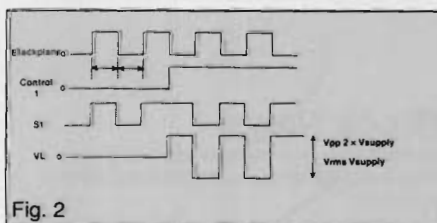
Static Drive

A static drive (non-multiplexed) TN LCD has segments which can be modeled as capacitive elements with parallel and series resistive elements, as shown in Fig. 1. The optical effect or contrast ratio produced by a segment depends on the RMS voltage applied across its capacitive element. The DC component of the drive signal must be minimized in order to



prevent damage to the LCD. The most commonly used drive technique uses an oscillator which produces a square wave with 50% duty cycle. This signal is applied to the LCD backplane or common electrode, and to one input of each of the EX-OR gates.

When the other input of the gate is at logic ground, the gate output is identical to the backplane signal and the RMS voltage across the segment is zero, as shown in Fig. 2. When the input of the gate is high, the gate output is 180° out of phase from the backplane signal, and the RMS voltage across the segments is equal to the logic supply voltage. Note that it



is important to use CMOS devices for the oscillator output and EX-OR gates, since CMOS outputs "swing very close to the rails", assuring that the DC component seen by the LCD is less than 100 mV.

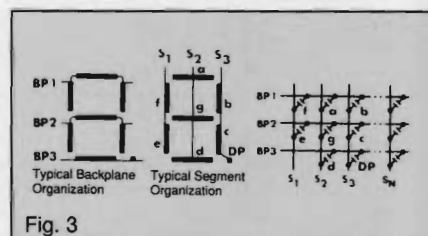
The backplane should have a frequency of at least 30 Hz to prevent display flicker, and no more than 100 Hz to prevent ghosting. Ghosting is partial activation of segments which are being driven off.

This partial activation is a result of internal coupling due to isolation of the capacitive elements from the drive signals by the crossover spreading resistances.

In general, as drive frequency and voltage increases, ghosting is more likely to occur. Ghosting problems are avoided by proper display design and choice of driving conditions. It is important that all unused segment lines be connected to the backplane line.

Multiplex Drive

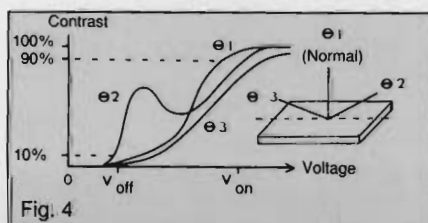
A multiplexed LCD is partitioned as a matrix consisting of M rows and N columns. At each matrix location, an active element is formed, which is



electrically equivalent to a lossy, non-linear capacitor. An example is shown in Fig. 3.

For example, a 6 digit, 7 segment display utilizing 3 backplanes would have the 42 segments arranged on a 3 x 18 matrix - decimal points, symbols, or annunciators could be positioned on the 12 unused matrix locations. Matrix partitioning of display elements is also applicable to segmented alphanumeric, dot matrix, and bargraph displays. Amplitude varying, time synchronized waveforms are generated by the LCD driver and applied to the row and column lines of the display matrix (refer to the driver data sheets for detailed explanation of waveforms).

Segment contrast is a function of the RMS value of the (Fig. 4) backplane minus frontplane waveforms at that

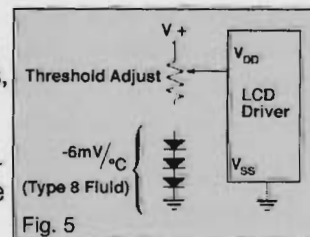


matrix location. Waveforms can be generated such that, at any point in the matrix, the resultant RMS voltage is either above the saturation voltage, or below the visual threshold voltage.

When viewed off-normal, the display will exhibit variations in the contrast vs drive voltage characteristic. Von/Voff should be adjusted in order to optimize the viewing characteristics of the display for the LC material used and the viewing direction requirements of the application. Due to the correlation properties of the driver waveforms, the ratio of Von and Voff approaches unity as the multiplex order increases (number of backplanes increase).

The maximum acceptable multiplex order depends on the sharpness of the contrast vs voltage curve, required operating temperature range, and the viewing cone requirements of the particular application.

As temperature increases, the contrast vs drive voltage curve shifts to the left.

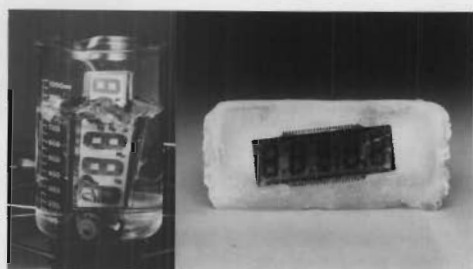


In order to maintain optimum contrast over wide temperature variations, the drive level should be varied in order to compensate for this negative threshold temperature coefficient (dv/dt). See Fig. 5. A series combination of silicon diodes, each with a temperature coefficient of -2mV/°C can be used for compensation over a temperature range of about 0 to 50°C.

Beyond this range, the display dv/dt curve is nonlinear and fixed compensation may result in less than optimum viewing characteristics.



Standard LCD operating characteristics



Static drive LCDs** (PAGES 7-10)

Multiplex drive LCDs** (PAGES 11-13)

	Min.	Typ.	Max.	Min.	Typ.	Max.	Units
Operating Voltage	3	5	15	N/A	N/A	N/A	VRMS
DC Drive Component Allowable	—	—	50	—	—	100	mV
Operating Frequency Range	30	60	100	30	—	250	HZ
Current	—	3	5	—	3	5	μA/cm ²
Capacitance	—	1200	—	—	1200	—	pF
Visual Threshold							
10% ON (V ₁₀)	—	1.9	—	—	1.9	—	VRMS
90% ON (V ₉₀)	—	2.9	—	—	2.9	—	VRMS
dV/dT	—	-9	—	—	-9	—	mV/°C
Response time							
TON @20°C	—	40	—	—	25	—	msec
TOFF @20°C	—	50	—	—	50	—	msec
TON @0°C	—	100	—	—	50	—	msec
TOFF @0°C	—	100	—	—	100	—	msec
Operating Temperature Range*	-20	—	+80	-20	—	+80	°C
Storage Temperature Range**	-40	—	+80	-55	—	+80	°C
Expected Life	—	100k	—	—	100k	—	hours
Viewing Angle	12 o'clock			12 o'clock			
Viewing Mode	Black segments against a silver transfective background.						
Connection Method	Standard 0.100" pitch DIL/SIL pins (0.250" length).						

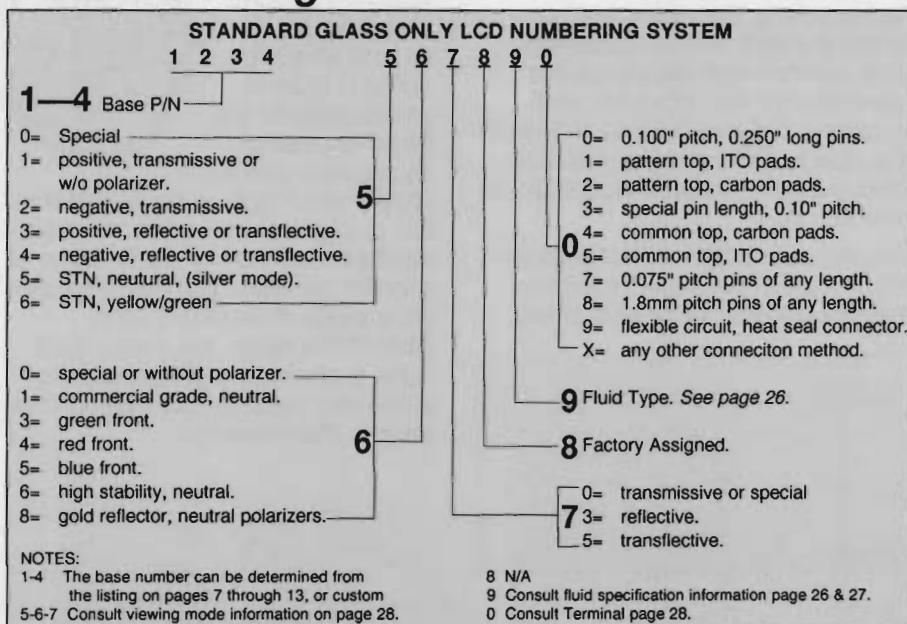
N/A = not applicable

Conditions unless otherwise noted are static drive (5vRMS @ 60Hz) with an ambient temperature of 20°C.

* Minimum operating temperature is specified as the temperature at which one update per second is possible (TON + TOFF $\leq$ 1 second). For multiplex LCDs, temperature compensation of the drive voltage may be required to realize satisfactory operation over the entire operating temperature range.

** The above specifications refer to standard distributor stock part numbers listed below. Other fluid options are available, refer to pages 26 and 27.

Part Numbering



Stock Items

Standard LCD stock part numbers available for immediate shipment through authorized Standish distributors.

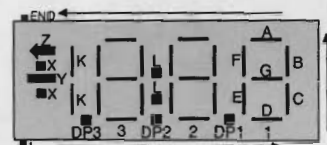
# Of Digits	Static(S) or Multiplex(M) Drive	Part Number	Catalog Page
4(0.35")	S	3900-365-920	7
3-1/2(0.5")	S	3901-365-920	7
3-1/2(0.5")	S	3902-365-920	7
4(0.5")	S	3906-365-920	7
6(0.5")	S	3918-365-920	8
6(0.7")	S	3919-365-420	9
6(1.0")	S	3920-365-420	9
8(0.5")	S	3922-365-420	9
2(0.5")	S	3935-365-920	9
3(0.35")	S	3940-365-920	9
bargraph	S	3975-365-420	10
4-1/2(0.5")	M	4201-365-420	11
8 dot matrix	M	4284-365-420	13
16 dot matrix	M	4285-365-420	13

NOTE: All of the LCDs listed are positive image high stability transfective viewing mode. Other viewing mode options are available. Consult factory.

Standard static drive LCDs

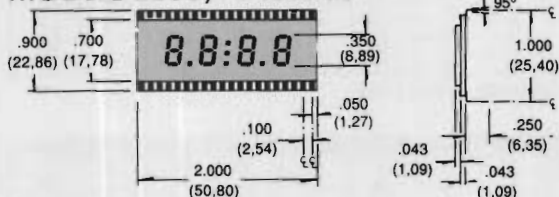
PIN-OUT ASSIGNMENT

Pin-out sequences begin with the first pin located in the lower left corner of the LCD and continue to the right, with the last pin number in the top left corner. Digits are numbered from right to left. BP(COM) = Backplane (common) Electrode NC = No Contact

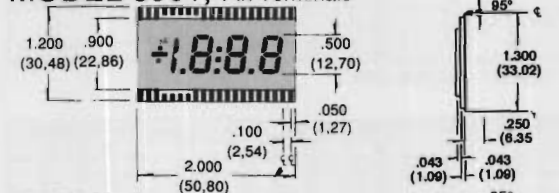


ALL SEVEN SEGMENT DIGIT MODELS

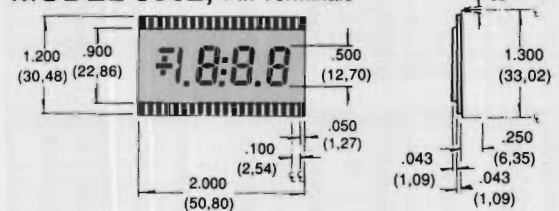
MODEL 3900, Pin Terminals



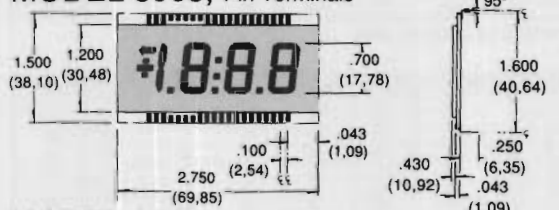
MODEL 3901, Pin Terminals



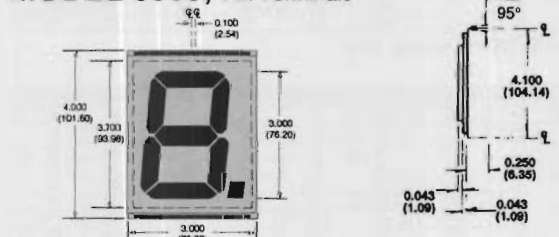
MODEL 3902, Pin Terminals



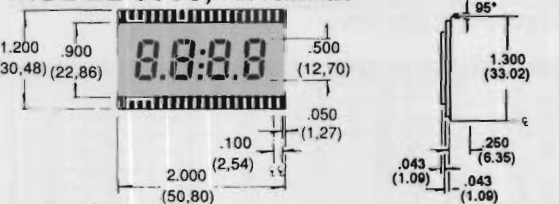
MODEL 3903, Pin Terminals



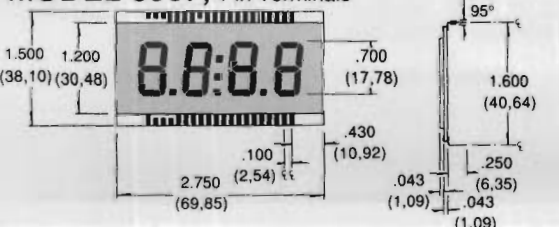
MODEL 3905, Pin Terminals



MODEL 3906, Pin Terminals



MODEL 3907, Pin Terminals



Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment
1	BP(COM)	9	E3	17	E1	25	A2	33	NC
2	NC	10	D3	18	D1	26	F2	34	B4
3	NC	11	C3	19	C1	27	G2	35	A4
4	NC	12	DP2	20	B1	28	L	36	F4
5	E4	13	E2	21	A1	29	B3	37	G4
6	D4	14	D2	22	F1	30	A3	38	NC
7	C4	15	C2	23	G1	31	F3	39	NC
8	DP3	16	DP1	24	B2	32	G3	40	BP(COM)

ELASTOMERIC VERSION = MODEL 3950

Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment
1	BP(COM)	9	E3	17	E1	25	A2	33	NC
2	Y	10	D3	18	D1	26	F2	34	NC
3	K	11	C3	19	C1	27	G2	35	NC
4	NC	12	DP2	20	B1	28	L	36	NC
5	NC	13	E2	21	A1	29	B3	37	NC
6	NC	14	D2	22	F1	30	A3	38	Z
7	NC	15	C2	23	G1	31	F3	39	X
8	DP3	16	DP1	24	B2	32	G3	40	BP(COM)

ELASTOMERIC VERSION = MODEL 3933

Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment
1	BP(COM)	9	E3	17	E1	25	A2	33	NC
2	Y	10	D3	18	D1	26	F2	34	NC
3	K	11	C3	19	C1	27	G2	35	NC
4	NC	12	DP2	20	B1	28	L	36	NC
5	NC	13	E2	21	A1	29	B3	37	NC
6	NC	14	D2	22	F1	30	A3	38	Z
7	NC	15	C2	23	G1	31	F3	39	X
8	DP3	16	DP1	24	B2	32	G3	40	BP(COM)

ELASTOMERIC VERSION = MODEL 3962

Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment
1	BP(COM)	9	3E	17	1E	25	2A	33	NC
2	Y	10	3D	18	1D	26	2F	34	NC
3	K	11	3C	19	1C	27	2G	35	NC
4	NC	12	DP2	20	1B	28	L	36	NC
5	NC	13	2E	21	1A	29	3B	37	NC
6	NC	14	2D	22	1F	30	3A	38	Z
7	NC	15	2C	23	1G	31	3F	39	X
8	DP3	16	DP1	24	2B	32	3G	40	BP(COM)

ELASTOMERIC VERSION = MODEL 3953

MODEL 3903 IS ALSO AVAILABLE IN A "LO BAT" VERSION - MODEL 3941

Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment
1	BP(COM)	11	D	21	DP	31	B	41	A
2	BP(COM)	12	D	22	DP	32	B	42	A
3	BP(COM)	13	D	23	DP	33	B	43	A
4	BP(COM)	14	D	24	DP	34	B	44	A
5	BP(COM)	15	D	25	DP	35	B	45	A
6	E	16	C	26	G	36	NC	46	F
7	E	17	C	27	G	37	NC	47	F
8	E	18	C	28	G	38	NC	48	F
9	E	19	C	29	G	39	NC	49	F
10	E	20	C	30	G	40	NC	50	F

Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment
1	BP(COM)	9	E3	17	E1	25	A2	33	NC
2	NC	10	D3	18	D1	26	F2	34	B4
3	NC	11	C3	19	C1	27	G2	35	A4
4	NC	12	DP2	20	B1	28	L	36	F4
5	E4	13	E2	21	A1	29	B3	37	G4
6	D4	14	D2	22	F1	30	A3	38	NC
7	C4	15	C2	23	G1	31	F3	39	NC
8	DP3	16	DP1	24	B2	32	G3	40	BP(COM)

ELASTOMERIC VERSION = MODEL 3966

Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment
1	BP(COM)	9	3E	17	1E	25	2A	33	NC
2	NC	10	3D	18	1D	26	2F	34	4B
3	NC	11	3C	19	1C	27	2G	35	4A
4	NC	12	DP2	20	1B	28	L	36	4F
5	4E	13	2E	21	1A	29	3B	37	4G
6	4D	14	2D	22	1F	30	3A	38	NC
7	4C	15	2C	23	1G	31	3F	39	NC
8	DP3	16	DP1	24	2B	32	3G	40	NC

ELASTOMERIC VERSION = MODEL 3967

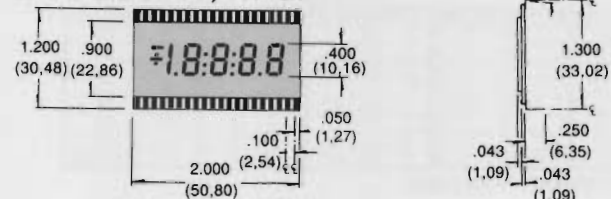
Standard static drive LCDs



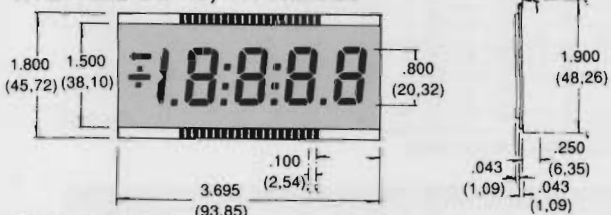
MODEL 3908, Pin Terminals



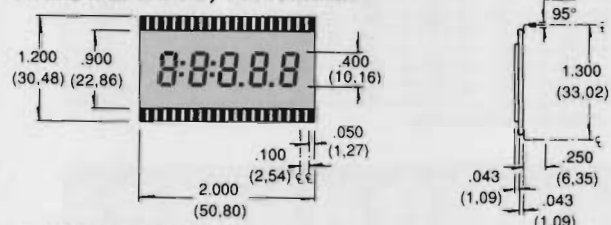
MODEL 3909, Pin Terminals



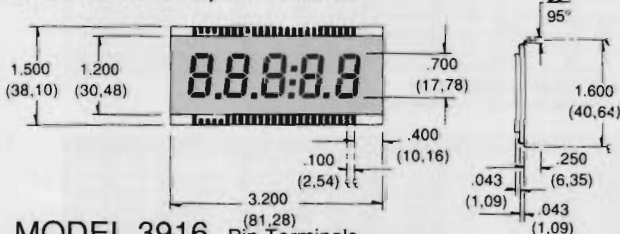
MODEL 3912, Pin Terminals



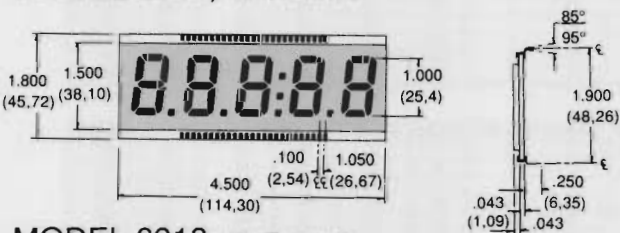
MODEL 3913, Pin Terminals



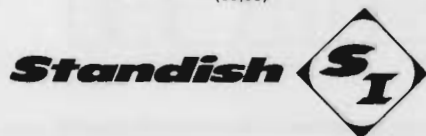
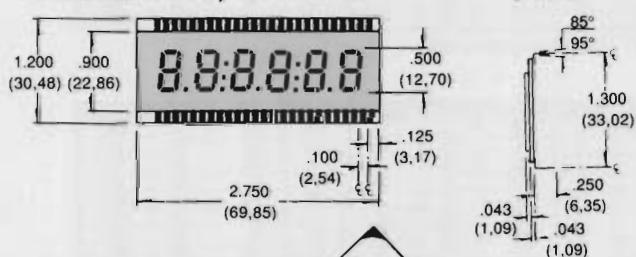
MODEL 3915, Pin Terminals



MODEL 3916, Pin Terminals



MODEL 3918, Pin Terminals



Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment
1	BP (COM)	9	3E	17	1E	25	2A	33	NC
2	NC	10	3D	18	1D	26	2F	34	4B
3	NC	11	3C	19	1C	27	2G	35	4A
4	NC	12	DP2	20	1B	28	L	36	4F
5	4E	13	2E	21	1A	29	3B	37	4G
6	4D	14	2D	22	1F	30	3A	38	NC
7	4C	15	2C	23	1G	31	3F	39	NC
8	DP3	16	DP1	24	2B	32	3G	40	NC

ELASTOMERIC VERSION = MODEL 3968

Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment
1	BP (COM)	9	3E	17	1E	25	2A	33	L2
2	Y	10	3D	18	1D	26	2F	34	4B
3	K	11	3C	19	1C	27	2G	35	4A
4	DP4	12	DP2	20	1B	28	L1	36	4F
5	4E	13	2E	21	1A	29	3B	37	4G
6	4D	14	2D	22	1F	30	3A	38	Z
7	4C	15	2C	23	1G	31	3F	39	X
8	DP3	16	DP1	24	2B	32	3G	40	BP (COM)

ELASTOMERIC VERSION = MODEL 3959

Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment
1	BP (COM)	9	3E	17	1E	25	2A	33	L2
2	Y	10	3D	18	1D	26	2F	34	4B
3	K	11	3C	19	1C	27	2G	35	4A
4	DP4	12	DP2	20	1B	28	L1	36	4F
5	4E	13	2E	21	1A	29	3B	37	4G
6	4D	14	2D	22	1F	30	3A	38	Z
7	4C	15	2C	23	1G	31	3F	39	X
8	DP3	16	DP1	24	2B	32	3G	40	BP (COM)

ELASTOMERIC VERSION = MODEL 3952

Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment
1	BP (COM)	9	3E	17	1E	25	2A	33	4B
2	5G	10	3D	18	1D	26	2F	34	4A
3	5E	11	3C	19	1C	27	2G	35	4F
4	5D	12	DP2	20	1B	28	3B	36	4G
5	5C	13	2E	21	1A	29	3A	37	L2
6	4E	14	2D	22	1F	30	3F	38	5B
7	4D	15	2C	23	1G	31	3G	39	5A
8	4C	16	DP1	24	2B	32	L1	40	5F

ELASTOMERIC VERSION = MODEL 3963

Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment
1	BP (COM)	11	4D	21	DP4	31	2F	41	4G
2	NC	12	4C	22	1E	32	2G	42	NC
3	NC	13	DP2	23	1D	33	L	43	5B
4	NC	14	3E	24	1C	34	3B	44	5A
5	NC	15	3D	25	1B	35	3A	45	5F
6	5E	16	3C	26	1A	36	3F	46	5G
7	5D	17	DP3	27	1F	37	3G	47	NC
8	5C	18	2E	28	1G	38	4B	48	NC
9	DP1	19	2D	29	2B	39	4A	49	NC
10	4E	20	2C	30	2A	40	4F	50	NC

ELASTOMERIC VERSION = MODEL 3965

Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment
1	BP (COM)	11	4D	21	DP	31	2F	41	4G
2	NC	12	4C	22	1E	32	2G	42	NC
3	NC	13	DP3	23	1D	33	L	43	5B
4	NC	14	3E	24	1C	34	3B	44	5A
5	NC	15	3D	25	1B	35	3A	45	5F
6	5E	16	3C	26	1A	36	3F	46	5G
7	5D	17	DP2	27	1F	37	3G	47	NC
8	5C	18	2E	28	1G	38	4B	48	NC
9	DP4	19	2D	29	2B	39	4A	49	NC
10	4E	20	2C	30	2A	40	4F	50	NC

ELASTOMERIC VERSION = MODEL 3976

Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment
1	BP (COM)	11	D4	21	DP1	31	F2	41	G4
2	E6	12	C4	22	E1	32	G2	42	L2
3	D6	13	DP3	23	D1	33	L1	43	B5
4	C6	14	E3	24	C1	34	B3	44	A5
5	DP5	15	D3	25	B1	35	A3	45	F5
6	E5	16	C3	26	A1	36	F3	46	G5
7	D5	17	DP2	27	F1	37	G3	47	B6
8	C5	18	E2	28	G1	38	B4	48	A6
9	DP4	19	D2	29	B2	39	A4	49	F6
10	E4	20	C2	30	A2	40	F4	50	G6

ELASTOMERIC VERSION = MODEL 3978

Reference: page #7 for segment and pin numbering information

MODEL 3919, Pin Terminals

1.500 (38.10) 1.200 (30.48) .700 (17.78) .650 (16.51) .100 (2.54) 3.695 (93.85) .043 (1.09) .109 (2.77) .250 (6.35) 1.600 (40.64) 85° 95°

Technical drawing of the Model 2025 digital scale. The drawing shows a top view and a side view. The top view shows a rectangular display with four digits, each 0.900 inches high. The total width is 3.695 inches. The side view shows a thickness of 0.125 inches and a total height of 1.300 inches. Dimensions are given in inches and millimeters.

Pin No.	Segment	Pin No.	Segment
1	BP(COM)	10	B1
2	DP2	11	A1
3	E2	12	F1
4	D2	13	G1
5	C2	14	B2
6	DP1	15	A2
7	E1	16	F2
8	D1	17	G2
9	C1	18	BP(COM)

ELASTOMERIC VERSION = MODEL 3969

ELASTOMERIC VERSION = MODEL 3980ELASTOMERIC VERSION = MODEL 3972

Technical drawing showing the front view of a rectangular component with dimensions:

- Total width: 900 (22,86)
- Distance from left edge to center of display: 700 (17,78)
- Display width: 350 (8,89)
- Distance from right edge of display to right edge of component: 1.000 (25,40)
- Top mounting hole diameter: Ø50 (1,27)
- Mounting hole offset from top edge: .100 (2,54)
- Bottom mounting hole diameter: Ø50 (1,27)
- Mounting hole offset from bottom edge: .100 (2,54)
- Distance between mounting holes: 1.200 (30,48)
- Right side mounting hole diameter: Ø43 (1,09)
- Right side mounting hole offset from right edge: .250 (6,35)
- Right side mounting hole offset from bottom edge: .043 (1,09)

Pin No.	Segment	Pin No.	Segment
1	E3	13	A1
2	D3	14	F1
3	C3	15	G1
4	DP2	16	B2
5	E2	17	A2
6	D2	18	F2
7	C2	19	G2
8	DP1	20	B3
9	E1	21	A3
10	D1	22	F3
11	C1	23	G3
12	B1	24	BP(COM)

ELASTOMERIC VERSION = MODEL 3990

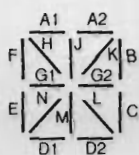
Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment
1	BP(COM)	9	3E	17	1E	25	2A	33	L2
2	Y	10	3D	18	1D	26	2F	34	4B
3	K	11	3C	19	1C	27	2G	35	4A
4	DP4	12	DP2	20	1B	28	L1	36	4F
5	4E	13	2E	21	1A	29	3B	37	4G
6	4D	14	2D	22	1F	30	3A	38	Lo Bat
7	4C	15	2C	23	1G	31	3F	39	X
8	DP3	16	DP1	24	2B	32	3G	40	BP(COM)

ELASTOMERIC VERSION = MODEL 3989

Cont#	Segment	Cont#	Segment	Cont#	Segment	Cont#	Segment	Cont#	Segment	Cont#	Segment
1	BP(COM)	25	6D2	49	3N	73	BP(COM)	97	3G1	121	6A1
2	NC	26	6L	50	3D1	74	1B	98	NC	122	6H
3	8E	27	6C	51	3M	75	1K	99	4B	123	6F
4	8N	28	6G2	52	3D2	76	1A2	100	4K	124	6G1
5	8D1	29	NC	53	3L	77	1J	101	4A2	125	NC
6	8M	30	5E	54	3C	78	1A1	102	4J	126	7B
7	8D2	31	5N	55	3G2	79	1H	103	4A1	127	7K
8	8L	32	5D1	56	2E	80	1F	104	4H	128	7A2
9	8C	33	5M	57	2N	81	1G1	105	4F	129	7J
10	8G2	34	5D2	58	2D1	82	2B	106	4G1	130	7A1
11	NC	35	5L	59	2M	83	2K	107	NC	131	7H
12	7E	36	5C	60	2D2	84	2A2	108	5B	132	7F
13	7N	37	5G2	61	2L	85	2J	109	5K	133	7G1
14	7D1	38	NC	62	2C	86	2A1	110	5A2	134	NC
15	7M	39	4E	63	2G2	87	2H	111	5J	135	8B
16	7D2	40	4N	64	1E	88	2F	112	5A1	136	8A
17	7L	41	4D1	65	1N	89	2G1	113	5H	137	8A2
18	7C	42	4M	66	1D1	90	3B	114	5F	138	8J
19	7G2	43	4D2	67	1M	91	3K	115	5G1	139	8A1
20	NC	44	4L	68	1D2	92	3A2	116	NC	140	8H
21	6E	45	4C	69	1L	93	3J	117	6B	141	8F
22	6N	46	4G2	70	1C	94	3A1	118	6K	142	8G1
23	6D1	47	NC	71	1G2	95	3H	119	6A2	143	NC
24	6M	48	3E	72	BP (COM)	96	3F	120	6J	144	BP (COM)

Reference: page #7 for segment and pin numbering information

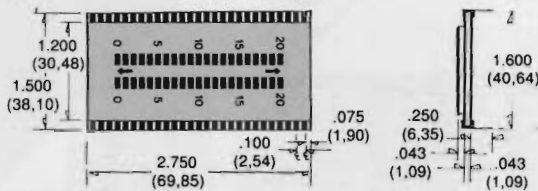
9



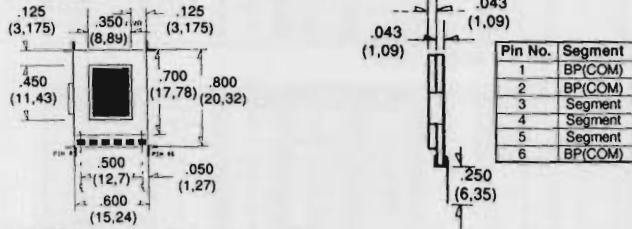
Standard static drive LCDs



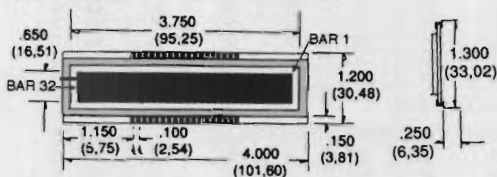
MODEL 3970, Pin Terminals



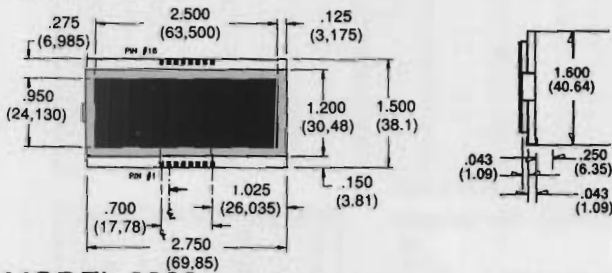
MODEL 3973, Pin Terminals



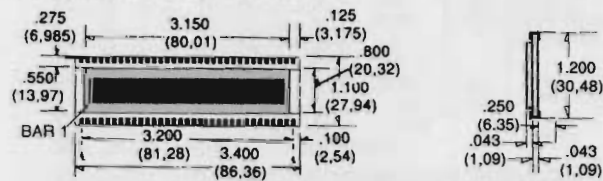
MODEL 3975, Pin Terminals



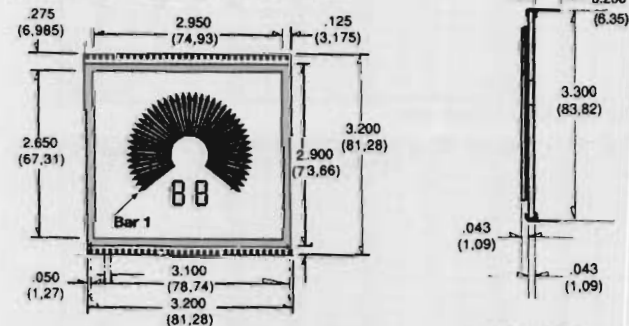
MODEL 3977, Pin Terminals



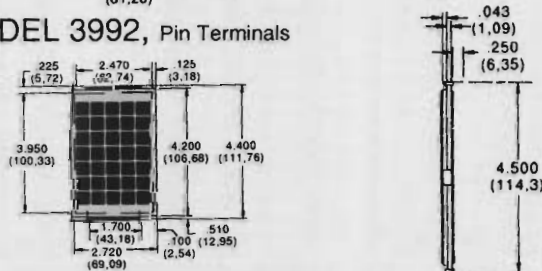
MODEL 3982, Pin Terminals



MODEL 3986, Pin Terminals



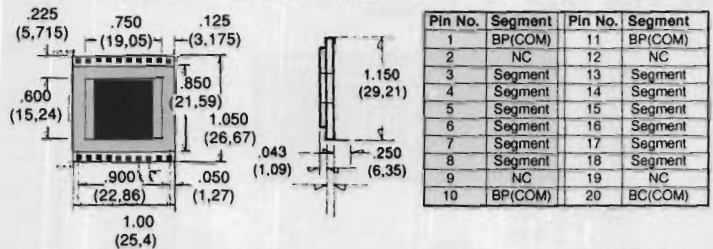
MODEL 3992, Pin Terminals



Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment
1	—	12	Bar 9	23	Bar 18	34	Bar 37	45	Bar 28
2	Bar 1	13	Bar 10	24	Bar 19	35	5R	46	Bar 27
3	20L	14	Bar 11	25	Bar 20	36	Bar 36	47	15R
4	Bar 2	15	10L	26	Ol, Bar 21	37	Bar 35	48	Bar 26
5	Bar 3	16	Bar 12	27	BP(COM)	38	Bar 34	49	Bar 25
6	Bar 4	17	Bar 13	28	—	39	Bar 33	50	Bar 24
7	Bar 5	18	Bar 14	29	Or, Bar 42	40	Bar 32	51	Bar 23
8	Bar 6	19	Bar 15	30	Bar 41	41	10R	52	Bar 22
9	15L	20	5L	31	Bar 40	42	Bar 31	53	20R
10	Bar 7	21	Bar 16	32	Bar 39	43	Bar 30	54	BP(COM)
11	Bar 8	22	Bar 17	33	Bar 38	44	Bar 29	—	—

ELASTOMERIC VERSION = MODEL 3995

MODEL 3974, Pin Terminals



Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment
1	BP(COM)	10	Bar 15	20	Bar 2	29	Bar 20
2	Bar 31	11	Bar 13	21	Bar 4	30	Bar 22
3	Bar 29	12	Bar 11	22	Bar 6	31	Bar 24
4	Bar 27	13	Bar 9	23	Bar 8	32	Bar 26
5	Bar 25	14	Bar 7	24	Bar 10	33	Bar 28
6	Bar 23	15	Bar 5	25	Bar 12	34	Bar 30
7	Bar 21	16	Bar 3	26	Bar 14	35	Bar 32
8	Bar 19	17	Bar 1	27	Bar 16	36	BP(COM)
9	Bar 17	18-19	BP(COM)	28	Bar 18	—	—

ELASTOMERIC VERSION = MODEL 3981



Pin No.	Segment	Pin No.	Segment
1	BP(COM)	9	NC
2	Segment	10	NC
3	Segment	11	NC
4	Segment	12	NC
5	Segment	13	NC
6	Segment	14	NC
7	Segment	15	NC
8	BP(COM)	16	NC

Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment
1	BP(COM)	15	Bar 28	29	Bar 56	43	Bar 47	57	Bar 19
2	Bar 2	16	Bar 30	30	Bar 58	44	Bar 45	58	Bar 17
3	Bar 4	17	Bar 32	31	Bar 60	45	Bar 43	59	Bar 15
4	Bar 6	18	Bar 34	32	Bar 62	46	Bar 41	60	Bar 13
5	Bar 8	19	Bar 36	33	Bar 64	47	Bar 39	61	Bar 11
6	Bar 10	20	Bar 38	34	BP(COM)	48	Bar 37	62	Bar 9
7	Bar 12	21	Bar 40	35	Bar 63	49	Bar 35	63	Bar 7
8	Bar 14	22	Bar 42	36	Bar 61	50	Bar 33	64	Bar 5
9	Bar 16	23	Bar 44	37	Bar 59	51	Bar 31	65	Bar 3
10	Bar 18	24	Bar 46	38	Bar 57	52	Bar 29	66	Bar 1
11	Bar 20	25	Bar 48	39	Bar 55	53	Bar 27	—	—
12	Bar 22	26	Bar 50	40	Bar 53	54	Bar 25	—	—
13	Bar 24	27	Bar 52	41	Bar 51	55	Bar 23	—	—
14	Bar 26	28	Bar 54	42	Bar 49	56	Bar 21	—	—

Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment
1	Bar 7	14	2D	27	Bar 42	40	Bar 29	53	Bar 19
2	Bar 6	15	2C	28	Bar 41	41	Bar 28	54	Bar 18
3	Bar 5	16	2B	29	Bar 40	42	Bar 27	55	Bar 17
4	Bar 4	17	1A	30	Bar 39	43	Bar 26	56	Bar 16
5	Bar 3	18	1F	31	Bar 38	44	Bar 25	57	Bar 15
6	Bar 2	19	1G	32	Bar 37	45	NC	58	Bar 14
7	Bar 1	20	1E	33	Bar 36	46	Bar 24	59	Bar 13
8	BP(COM)	21	1D	34	Bar 35	47	Bar 23	60	Bar 12
9	BP(COM)	22	1C	35	Bar 34	48	NC	61	Bar 11
10	2A	23	1B	36	Bar 33	49	Bar 22	62	Bar 10
11	2F	24	BP(COM)	37	Bar 32	50	Bar 21	63	Bar 9
12	2G	25	BP(COM)	38	Bar 31	51	NC	64	Bar 8
13	2E	26	Bar 43	39	Bar 30	52	Bar 20	—	—

ELASTOMERIC VERSION = MODEL 3997

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30
31	32	33	34	35

Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment
1	Box 16	10	Box 28	19	Box 11	28	Box 3
2	Box 21	11	Box 33	20	Box 6	29	Box 19
3	Box 26	12	Box 24	21	Box 1	30	Box 14
4	Box 31	13	Box 29	22	Box 17	31	Box 9
5	Box 22	14	Box 34	23	Box 12	32	Box 4
6	Box 27	15	Box 20	24	Box 7	33	Box 15
7	Box 32	16	Box 25	25	Box 2	34	Box 10
8	Box 18	17	Box 30	26	Box 13	35	Box 5
9	Box 23	18	Box 35	27	Box 8	36	BP(COM)

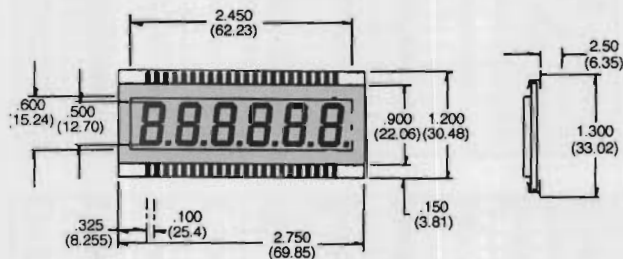
Reference: page #7 for segment and pin numbering information

Standard multiplex drive LCDs

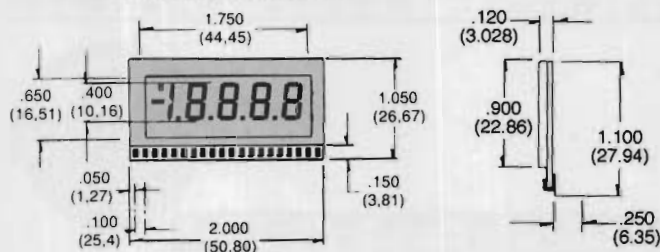
Standish



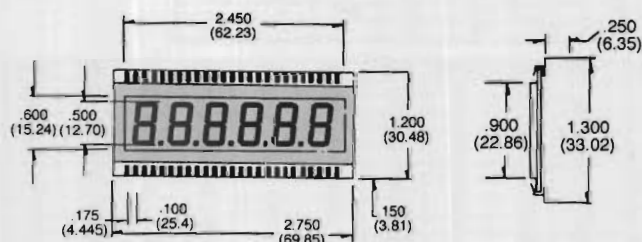
MODEL 4200, Pins or elastomeric



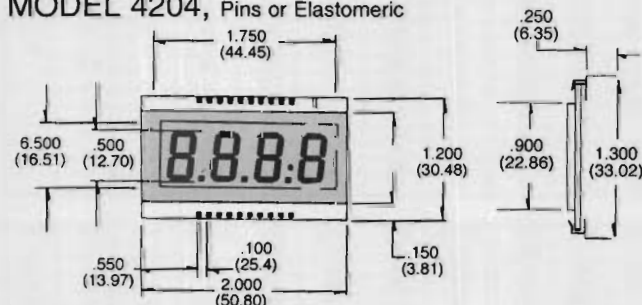
MODEL 4201, Pin Terminals



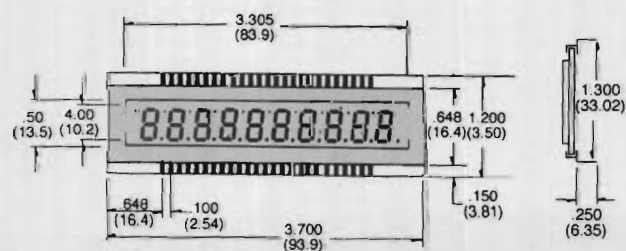
MODEL 4203, Pins or Elastomeric



MODEL 4204, Pins or Elastomeric



MODEL 4205, Pins or Elastomeric



CONT#	BP1	BP2	BP3	BP4	CONT#	BP1	BP2	BP3	BP4
1	—	—	—	BP4	23	—	BP2	—	—
2	—	—	—	BP4	24	—	BP2	—	—
3	6F	6G	6E	6D	25	NC	NC	NC	NC
4	6A	6B	6C	DP6	26	NC	NC	NC	NC
5	NC	NC	NC	NC	27	NC	NC	NC	NC
6	5F	5G	5E	5D	28	NC	NC	NC	NC
7	5A	5B	5C	DP5	29	NC	NC	NC	NC
8	NC	NC	NC	NC	30	NC	NC	NC	NC
9	4F	4G	4E	4D	31	NC	NC	NC	NC
10	4A	4B	4C	DP4	32	NC	NC	NC	NC
11	NC	NC	NC	NC	33	NC	NC	NC	NC
12	3F	3G	3E	3D	34	NC	NC	NC	NC
13	3A	3B	3C	DP3	35	NC	NC	NC	NC
14	NC	NC	NC	NC	36	NC	NC	NC	NC
15	2F	2G	2E	2D	37	NC	NC	NC	NC
16	2A	2B	2C	DP2	38	NC	NC	NC	NC
17	NC	NC	NC	NC	39	NC	NC	NC	NC
18	NC	NC	NC	NC	40	NC	NC	NC	NC
19	1F	1G	1E	1D	41	NC	NC	NC	NC
20	1A	1B	1C	DP1	42	NC	NC	NC	NC
21	—	—	BP3	—	43	BP1	—	—	—
22	—	—	BP3	—	44	BP1	—	—	—



CONT#	BP1	BP2	BP3	CONT #	BP1	BP2	BP3
1	BP1	—	—	11	3B	3C	Y
2	—	—	BP3	12	2F	2E	DP2
3	NC	NC	NC	13	2A	2G	2D
4	NC	NC	NC	14	2B	2C	"B"
5	NC	NC	NC	15	1F	1E	DP1
6	4F	4E	DP4	16	1A	1G	1D
7	4A	4G	4D	17	1B	1C	—
8	4B	4C	K	18	NC	NC	—
9	3F	3E	DP3	19	—	—	BP3
10	3A	3G	3D	20	—	BP2	—

CONT#	BP1	BP2	BP3	CONT#	BP1	BP2	BP3	CONT#	BP1	BP2	BP3
1	—	BP2	—	18	2A	2G	2D	35	3B	3C	DP2
2	—	BP2	—	19	NC	NC	NC	36	NC	NC	NC
3	6F	6E	—	20	NC	NC	NC	37	NC	NC	NC
4	6A	6G	6D	21	1F	1E	—	38	NC	NC	NC
5	NC	NC	NC	22	1A	1G	1D	39	4B	4C	DP3
6	5F	5E	—	23	NC	NC	NC	40	NC	NC	NC
7	5A	5G	5D	24	—	—	BP3	41	NC	NC	NC
8	NC	NC	NC	25	—	—	BP3	42	NC	NC	NC
9	4F	4E	—	26	—	—	BP3	43	5B	5C	DP4
10	4A	4G	4D	27	—	—	BP3	44	NC	NC	NC
11	NC	NC	NC	28	1B	1C	—	45	NC	NC	NC
12	NC	NC	NC	29	NC	NC	NC	46	NC	NC	NC
13	3F	3E	—	30	NC	NC	NC	47	6B	6C	DP5
14	3A	3G	3D	31	2B	2C	DP1	48	NC	NC	NC
15	NC	NC	NC	32	NC	NC	NC	49	BP1	—	—
16	NC	NC	NC	33	NC	NC	NC	50	BP1	—	—
17	2F	2E	—	34	NC	NC	NC	—	—	—	—

CONT#	BP1	BP2	BP3	CONT #	BP1	BP2	BP3
1	NC	NC	NC	11	BP1	—	—
2	NC	NC	NC	12	1A	1G	1D
3	NC	NC	NC	13	1F	1E	—
4	4B	4C	DP3	14	2A	2G	2D
5	3B	3C	DP2	15	2F	2E	—
6	2B	2C	DP1	16	3A	3G	3D
7	1B	1C	—	17	3F	3E	—
8	—	—	DP3	18	4A	4G	4D
9	NC	NC	NC	19	4F	4E	—
10	NC	NC	NC	20	—	BP2	—

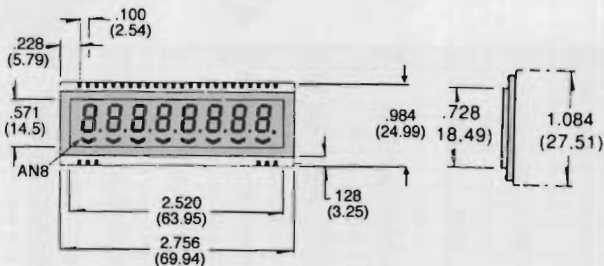
CONT#	BP1	BP2	BP3	CONT#	BP1	BP2	BP3	CONT#	BP1	BP2	BP3
1	—	—	BP3	18	4A	4G	4D	35	5B	5C	5DP
2	10T	10F	10E	19	NC	NC	NC	36	5A	5G	5D
3	9T	9F	9E	20	3T	3F	3E	37	NC	NC	NC
4	8T	8F	8E	21	3A	3G	3D	38	6B	6C	6DP
5	8A	8G	8D	22	NC	NC	NC	39	6A	6G	6D
6	NC	NC	NC	23	2T	2F	2E	40	NC	NC	NC
7	NC	NC	NC	24	1T	1F	1E	41	7B	7C	7DP
8	7T	7F	7E	25	1A	1G	1D	42	NC	NC	NC
9	7A	7G	7D	26	—	BP2	—	43	NC	NC	NC
10	NC	NC	NC	27	1B	1C	1DP	44	8B	8C	8DP
11	6T	6F	6E	28	2B	2C	2DP	45	NC	NC	NC
12	NC	NC	NC	29	2A	2G	2D	46	9B	9C	9DP
13	NC	NC	NC	30	3B	3C	3DP	47	9A	9G	9D
14	NC	NC	NC	31	NC	NC	NC	48	10B	10C	10DP
15	5T	5F	5E	32	NC	NC	NC	49	10A	10G	10D
16	NC	NC	NC	33	4B	4C	4DP	50	BP1	—	—
17	4T	4F	4E	34	NC	NC	NC	—	—	—	—

Reference: page #7 for segment and pin numbering information

Products & Specifications can change without further notice.

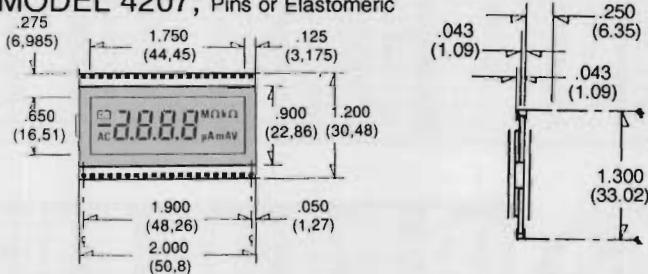
Standard multiplex drive LCDs

MODEL 4206, Pins or Elastomeric



Pin#	BP1	BP2	BP3	Pin#	BP1	BP2	BP3	Pin#	BP1	BP2	BP3
1	BP1	—	—	11	A7	G7	D7	21	B4	C4	DP4
2	—	BP2	—	12	B7	C7	DP7	22	F3	E3	AN3
3	—	—	BP3	13	F6	E6	AN6	23	A3	G3	D3
4	—	—	—	14	A6	G6	D6	24	B3	C3	DP3
5	—	BP2	—	15	B6	C6	DP6	25	F2	E2	AN2
6	BP1	—	—	16	F5	E5	AN5	26	A2	G2	D2
7	F8	E8	AN8	17	A5	G5	D5	27	B2	C2	DP2
8	A8	G8	D8	18	B5	C5	DP5	28	F1	E1	AN1
9	B8	C8	DP8	19	F4	E4	AN4	29	A1	G1	D1
10	F7	E7	AN7	20	A4	G4	D4	30	B1	C1	DP1

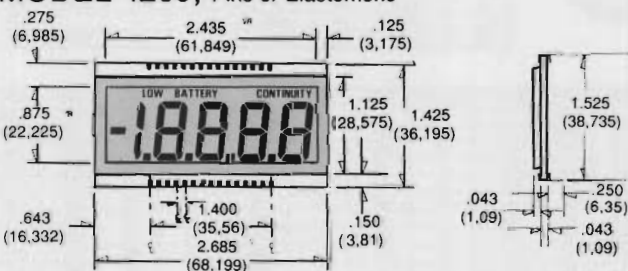
MODEL 4207, Pins or Elastomeric



CONT#	BP1	BP2	CONT#	BP1	BP2	CONT#	BP1	BP2	CONT#	BP1	BP2
1	—	—	11	NC	NC	21	BP1	—	31	2B	2C
2	Y	AC	12	1G	1E	22	NC	NC	32	2A	—
3	NC	NC	13	—	1D	23	Q	A	33	2F	DP2
4	3G	3E	14	NC	NC	24	k	m	34	3B	3C
5	—	3D	15	—	V	25	MO	μA	35	3A	—
6	NC	NC	16	NC	NC	26	NC	NC	36	3F	DP3
7	NC	NC	17	NC	NC	27	1B	1C	37	4B	4C
8	2G	2E	18	NC	NC	28	1A	—	38	4A,D,G	4E
9	—	2D	19	NC	NC	29	NC	NC	39	Batt.	—
10	NC	NC	20	—	BP2	30	1F	DP1	40	BP?	—



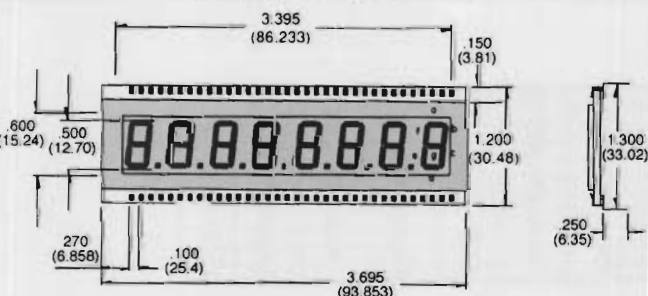
MODEL 4209, Pins or Elastomeric



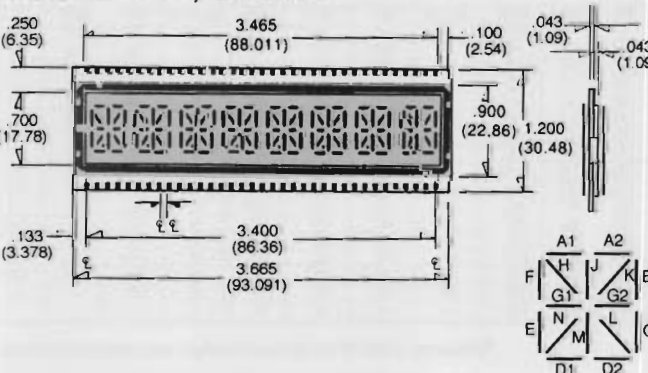
CONT#	BP1	BP2	BP3	CONT#	BP1	BP2	BP3
1	4F	4E	DP4	9	2B	2C	Low Battery
2	4A	4G	4D	10	1F	1E	DP1
3	4B	4C	K	11	1A	1G	1D
4	3F	3E	DP3	12	1B	1C	Continuity
5	3A	3G	3D	13	—	—	BP3
6	3B	3C	Y	14	—	BP2	—
7	2F	2E	DP2	15	BP1	—	—
8	2A	2G	2D	—	—	—	—

CONT#	BP1	BP2	BP3	CONT#	BP1	BP2	BP3	CONT#	BP1	BP2	BP3
1	—	—	BP3	26	—	2F	2E	51	NC	NC	NC
2	—	8F	8E	27	2A	2G	2D	52	NC	NC	NC
3	NC	NC	NC	28	NC	NC	NC	53	5B	5C	DP4
4	—	7F	7E	29	NC	NC	NC	54	NC	NC	NC
5	7A	7G	7D	30	—	1F	1E	55	NC	NC	NC
6	NC	NC	NC	31	1A	1G	1D	56	NC	NC	NC
7	NC	NC	NC	32	1B	1C	—	57	6B	6C	DP5
8	NC	NC	NC	33	NC	NC	NC	58	NC	NC	NC
9	—	6F	6E	34	BP1	—	—	59	NC	NC	NC
10	6A	6G	6D	35	BP1	—	—	60	NC	NC	NC
11	NC	NC	NC	36	NC	NC	NC	61	7B	7C	DP6
12	NC	NC	NC	37	NC	NC	NC	62	NC	NC	NC
13	—	5F	5E	38	NC	NC	NC	63	NC	NC	NC
14	5A	5G	5D	39	NC	NC	NC	64	NC	NC	NC
15	NC	NC	NC	40	2B	2C	DP1	65	NC	NC	NC
16	NC	NC	NC	41	NC	NC	NC	66	8B	8C	DP7
17	—	4F	4E	42	NC	NC	NC	67	8A	8G	8D
18	4A	4G	4D	43	NC	NC	NC	68	—	BP2	—
19	NC	NC	NC	44	3B	3C	DP2	—	—	—	—
20	NC	NC	NC	45	NC	NC	NC	—	—	—	—
21	NC	NC	NC	46	NC	NC	NC	—	—	—	—
22	—	3F	3E	47	NC	NC	NC	—	—	—	—
23	3A	3G	3D	48	4B	4C	DP3	—	—	—	—
24	NC	NC	NC	49	NC	NC	NC	—	—	—	—
25	NC	NC	NC	50	NC	NC	NC	—	—	—	—

MODEL 4216, Pins or Elastomeric



MODEL 4227, Elastomeric



CONT#	BP1	BP2	BP3	CONT#	BP1	BPx2	BP3	CONT#	BP1	BP2	BP3
1	—	—	BP3	25	3B	3C	3D2	49	NC	NC	NC
2	NC	NC	NC	26	NC	NC	NC	50	4A2	4K	4G2
3	8F	8E	8N	27	2F	2E	2N	51	4J	4M	4L
4	—	DP8	8D1	28	—	DP2	2D1	52	4A1	4H	4G1
5	8B	8C	8D2	29	2B	2C	2D2	53	NC	NC	NC
6	NC	NC	NC	30	NC	NC	NC	54	5A2	5K	5G2
7	7F	7E	7N	31	1F	1E	1N	55	5J	5M	5L
8	—	DP7	7D1	32	—	DP1	1D2	56	5A1	5H	5G1
9	7B	7C	7D2	33	1B	1C	1D2	57	NC	NC	NC
10	NC	NC	NC	34	—	—	BP3	58	6A2	6K	6G2
11	6F	6E	6N	35	—	BP2	—	59	6J	6M	6L
12	—	DP6	6D1	36	BP1	—	—	60	6A1	6H	6G1
13	6B	6C	6D2	37	NC	NC	NC	61	NC	NC	NC
14	NC	NC	NC	38	1A2	1K	1G2	62	7A2	7K	7G2
15	5F	5E	5N	39	1J	1M	1L	63	7J	7M	7L
16	—	DP5	5D1	40	1A1	1H	1G1	64	7A1	7H	7G1
17	5B	5C	5D2	41	NC	NC	NC	65	NC	NC	NC
18	NC	NC	NC	42	2A2	2K	2G2	66	8A2	8K	8G2
19	4F	4E	4N	43	2J	2M	2L	67	8J	8M	8L
20	—	DP4	4D1	44	2A1	2H	2G1	68	8A1	8H	8G1
21	4B	4C	4D2	45	NC	NC	NC	69	BP1	—	—
22	NC	NC	NC	46	3A2	3K	3G2	70	—	BP2	—
23	3F	3E	3N	47	3J	3M	3L	—	—	—	—
24	—	DP3	3D1	48	3A1	3H	3G1	—	—	—	—

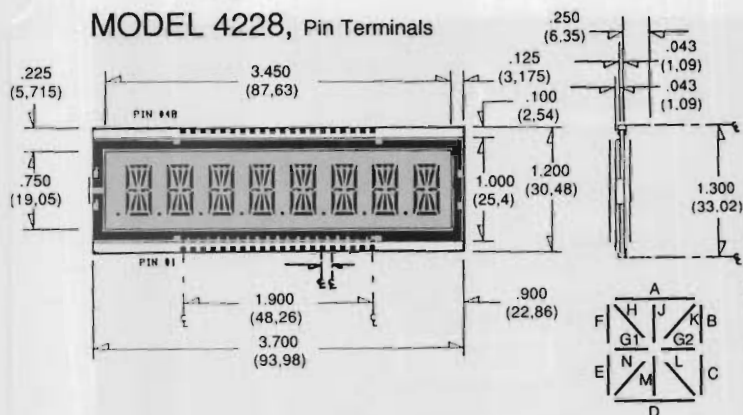
Reference: page #7 for segment and pin numbering information

Standard multiplex drive LCDs

Standish

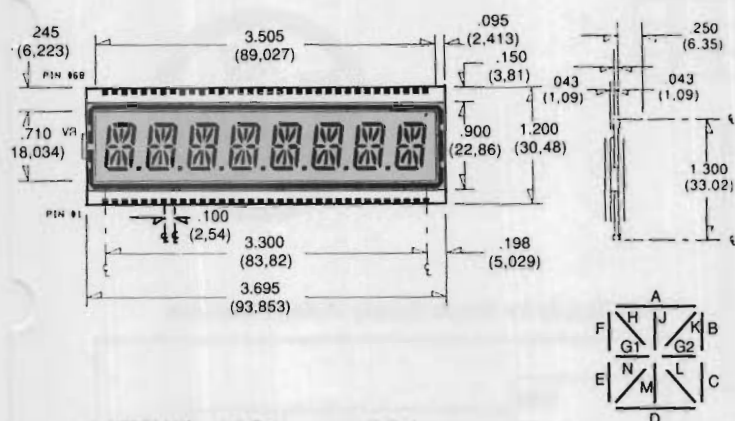


MODEL 4228, Pin Terminals



CONT#	BP1	BP2	BP3	BP4	CONT#	BP1	BP2	BP3	BP4
1	—	—	BP3	—	21	BP1	—	—	—
2	—	8F	8E	8D	22	1A	1B	1C	DP1
3	8J	8K	8G2	8L	23	1H	1G1	1N	1M
4	—	7F	7E	7D	24	2A	2B	2C	DP2
5	7J	7K	7G2	7L	25	2H	2G1	2N	2M
6	—	6F	6E	6D	26	3A	3B	3C	DP3
7	6J	6K	6G2	6L	27	3H	3G1	3N	3M
8	—	5F	5E	5D	28	4A	4B	4C	DP4
9	5J	5K	5G2	5L	29	NC	NC	NC	NC
10	—	4F	4E	4D	30	4H	4G1	4N	4M
11	NC	NC	NC	NC	31	NC	NC	NC	NC
12	4J	4K	4G2	4L	32	5A	5B	5C	DP5
13	NC	NC	NC	NC	33	5H	5G1	5N	5M
14	—	3F	3E	3D	34	6A	6B	6C	DP6
15	3J	3K	3G2	3L	35	6H	6G1	6N	6M
16	—	2F	2E	2D	36	7A	7B	7C	DP7
17	2J	2K	2G2	2L	37	7H	7G1	7N	7M
18	—	1F	1E	1D	38	8A	8B	8C	DP8
19	1J	1K	1G2	1L	39	8H	8G1	8N	8M
20	—	—	—	BP4	40	—	BP2	—	—

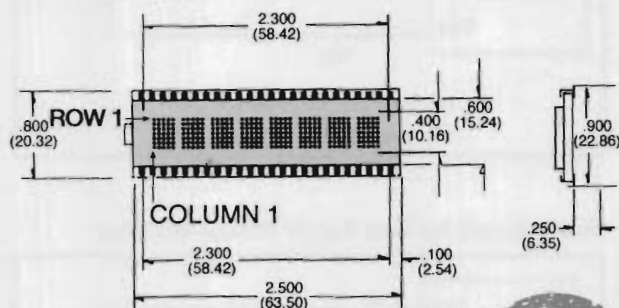
MODEL 4229, Pin Terminals



Pin No.	BP1	BP2	BP3	BP4	Pin No.	BP1	BP2	BP3	BP4
1	—	—	—	BP4	35	—	BP2	—	—
2	NC	NC	NC	NC	36	1A	1B	1C	—
3	NC	NC	NC	NC	37	NC	NC	NC	NC
4	—	8F	8E	8D	38	1H	1G1	1P	1N
5	NC	NC	NC	NC	39	NC	NC	NC	NC
6	8J	8K	8G2	8M	40	2A	2B	2C	DP1
7	NC	NC	NC	NC	41	NC	NC	NC	NC
8	—	7F	7E	7D	42	2H	2G1	2P	2N
9	NC	NC	NC	NC	43	NC	NC	NC	NC
10	7J	7K	7G2	7M	44	3A	3B	3C	DP2
11	NC	NC	NC	NC	45	NC	NC	NC	NC
12	—	6F	6E	6D	46	3H	3G1	3P	3N
13	NC	NC	NC	NC	47	NC	NC	NC	NC
14	6J	6K	6G2	6M	48	4A	4B	4C	DP3
15	NC	NC	NC	NC	49	NC	NC	NC	NC
16	—	5F	5E	5D	50	4H	4G1	4P	4N
17	NC	NC	NC	NC	51	NC	NC	NC	NC
18	5J	5K	5G2	5M	52	5A	5B	5C	DP4
19	NC	NC	NC	NC	53	NC	NC	NC	NC
20	—	4F	4E	4D	54	5H	5G1	5P	5N
21	NC	NC	NC	NC	55	NC	NC	NC	NC
22	4J	4K	4G2	4M	56	6A	6B	6C	DP5
23	NC	NC	NC	NC	57	NC	NC	NC	NC
24	—	3F	3E	3D	58	6H	6G1	6P	6N
25	NC	NC	NC	NC	59	NC	NC	NC	NC
26	3J	3K	3G2	3M	60	7A	7B	7C	DP6
27	NC	NC	NC	NC	61	NC	NC	NC	NC
28	—	2F	2E	2D	62	7H	7G1	7P	7N
29	NC	NC	NC	NC	63	NC	NC	NC	NC
30	2J	2K	2G2	2M	64	8A	8B	8C	DP7
31	NC	NC	NC	NC	65	NC	NC	NC	NC
32	—	1F	1E	1D	66	8H	8G1	8P	8N
33	1J	1K	1G2	1M	67	NC	NC	NC	NC
34	—	—	BP3	—	68	BP1	—	—	—

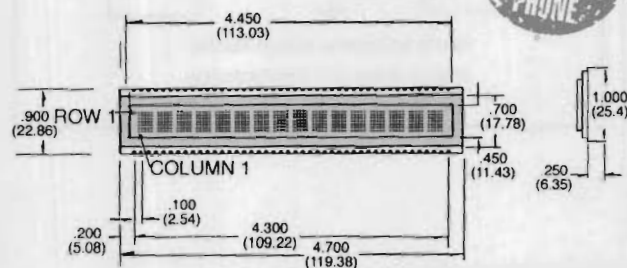
MODEL 4284 (TN), 4264 (STN),

Pins or Elastomeric



MODEL 4285 (TN), 4265 (STN),

Pins or Elastomeric



Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment
1	ROW 6	11	COL 17	21	COL 37	31	NC	41	COL 12
2	ROW 7	12	COL 19	22	COL 39	32	COL 30	42	COL 10
3	COL 1	13	COL 21	23	ROW 5	33	COL 28	43	COL 8
4	COL 3	14	COL 23	24	ROW 4	34	COL 26	44	COL 6
5	COL 5	15	COL 25	25	ROW 3	35	COL 24	45	COL 4
6	COL 7	16	COL 27	26	COL 40	36	COL 22	46	COL 2
7	COL 9	17	COL 29	27	COL 38	37	COL 20	47	ROW 1
8	COL 11	18	COL 31	28	COL 36	38	COL 18	48	ROW 2
9	COL 13	19	COL 33	29	COL 34	39	COL 16	—	—
10	COL 15	20	COL 35	30	COL 32	40	COL 14	—	—

Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment
1	ROW 6	19	COL 33	37	COL 69	55	COL 64	73	COL 28
2	ROW 7	20	COL 35	38	COL 71	56	COL 62	74	COL 26
3	COL 1	21	COL 37	39	COL 73	57	COL 60	75	COL 24
4	COL 3	22	COL 39	40	COL 75	58	COL 58	76	COL 22
5	COL 5	23	COL 41	41	COL 77	59	COL 56	77	COL 20
6	COL 7	24	COL 43	42	COL 79	60	COL 54	78	COL 18
7	COL 9	25	COL 45	43	ROW 5	61	COL 52	79	COL 16
8	COL 11	26	COL 47	44	ROW 4	62	COL 50	80	COL 14
9	COL 13	27	COL 49	45	ROW 3	63	COL 48	81	COL 12
10	COL 15	28	COL 51	46	NC	64	COL 46	82	COL 10
11	COL 17	29	COL 53	47	COL 80	65	COL 44	83	COL 8
12	COL 19	30	COL 55	48	COL 78	66	COL 42	84	COL 6
13	COL 21	31	COL 57	49	COL 76	67	COL 40	85	COL 4
14	COL 23	32	COL 59	50	COL 74	68	COL 38	86	COL 2
15	COL 25	33	COL 61	51	COL 72	69	COL 36	87	ROW 1
16	COL 27	34	COL 63	52	COL 70	70	COL 34	88	ROW 2
17	COL 29	35	COL 65	53	COL 68	71	COL 32	—	—
18	COL 31	36	COL 67	54	COL 66	72	COL 30	—	—

Reference: page #7 for segment and pin numbering information

Standard LCD modules

Operating Characteristics Alphanumeric Dot Matrix Modules

Electrical Characteristics (Vss = 0Volts)

PARAMETERS	Min.	Typ.	Max.	Units
Input Voltage — High (VIH)	2.2	—	Vdd	Volts
Input Voltage — Low (VIL)	-0.3	—	0.6	Volts
Output Voltage — High (VOH) -10h = 0.2mA	2.4	—	—	Volts
Output Voltage — Low (VOL) 10L = 1.2mA	—	—	0.4	Volts
Power Supply Current (Idd)	—	0.5	2.0	mA
Power Supply for Controller (Vdd-Vss)	0	—	7.0	Volts
Power Supply for LCD Drive (Vdd-Vo)*	0	—	13.5	Volts

*Voltage is to be optimized according to LCD Drive Level Table.
Note: Viewing angle is 6 o'clock.

Temperature Range

LCD TYPE	Operating Temperature		Storage Temperature		Units
STN SLC Version	0	+50	-20	+60	°C
STN SHC Version	-10	+60	-20	+70	°C
STN SHW Version	-20	+70	-30	+80	°C

Tolerances for all Standard Modules

ITEM	X axis	Y axis	Z axis
Overall Module	±0.5 (0.020")	±0.5 (0.020")	max. dimensions are specified*
PCB	±0.5 (0.020")	±0.5 (0.020")	1.6 ±0.2 (0.063" ±0.008")
Bezel Perimeter (in front of PCB)	±0.5 (0.020")	±0.5 (0.020")	±0.5 (0.020")
Bezel Window	±0.3 (0.012")	±0.3 (0.012")	N/A
Location of mounting holes	±0.5 (0.020")	±0.5 (0.020")	N/A

*Z axis specified includes all electronic components on rear of PCB.

LCD Drive Level (Vdd-Vo) by multiplex rate and LCD type*

Operating Temp.	8:1 MULTIPLEX		16:1 MULTIPLEX		
	STN LCD		STN LCD		
	SLC	SHW	SLC	SHC	SHW
-20 °C	—	9.50	—	9.60	10.00
-10 °C	5.35	9.40	5.08	9.10	9.80
0 °C	5.20	8.80	4.80	8.90	9.50
25 °C	4.85	7.40	4.65	8.50	9.35
50 °C	4.70	7.10	4.35	7.90	9.00

*There are typical values.

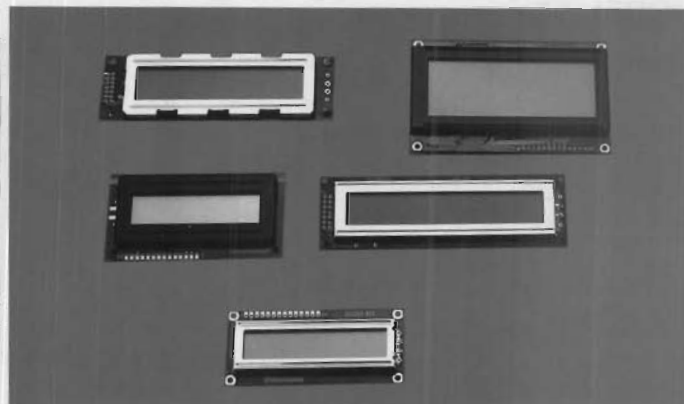
Interface Connections

PIN #	SYMBOL	IO	FUNCTIONS
1	Vss		(0v) Ground
2	Vdd		+5 Volt Power Supply**
3	Vo		Low Voltage for LCD Contrast (See Block Diagram)
4	RS	I	Register Select: 1 for data; 0 for instruction code
5	R/W	I	Read/Write: 1-read from module; 0-Write to module
6	E	I	Enable
7	DB0	I/O	Data bus lines used only in 8 bit transfer
8	DB1	I/O	
9	DB2	I/O	Data bus lines used only in 8 bit transfer
10	DB3	I/O	
11	DB4	I/O	Data bus lines used for both 4 and 8 bit transfer
12	DB5	I/O	
13	DB6	I/O	Data bus lines used for both 4 and 8 bit transfer DB7 also serves as Busy Flag for internal operations
14	DB7	I/O	
15*	LED+		Anode of LED (+)
16*	LED-		Cathode of LED (-)

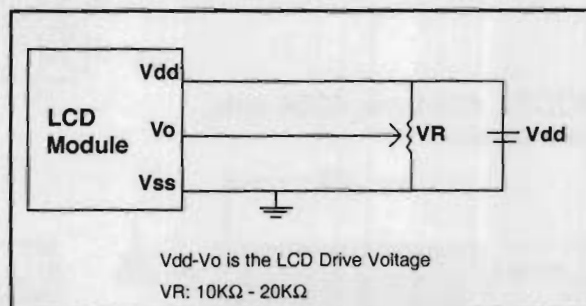
Note: This pinout is correct for all Alphanumeric Modules, excluding the SIM404, where pin #6 is a N/C, pin #15 is E1 (Enable for top two rows), and pin #16 is E2 (Enable for bottom two rows).

*LED Backlighting is optional on some models, **+5.0 V requires current limiting resistor.

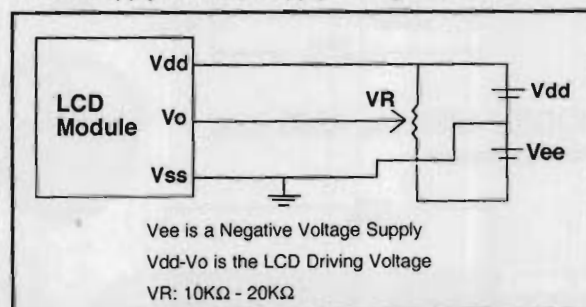
Products & Specifications can change without further notice.



Power Supply for Single Supply Voltage Modules



Power Supply for Dual Supply Voltage Modules



Standard LCD Modules

Alphanumeric dot matrix

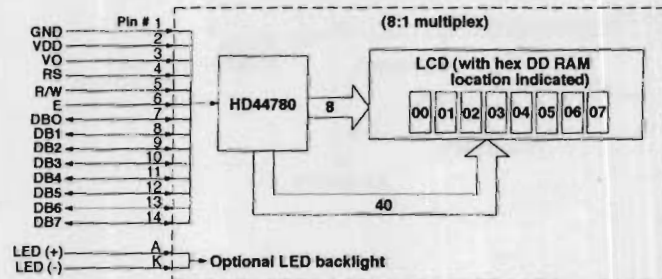
8 Characters x 1 Line

SIM81SLC

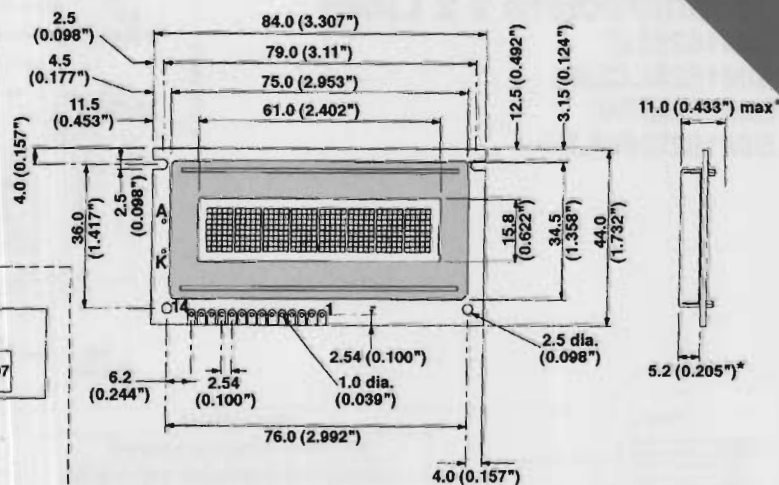
SIM81SLCLE4

SIM81SHW

SIM81SHWLE4



Character Format: 5 x 8
Character Size: 6.45 x 10.75 (0.254" x 0.423")
Character Pitch: 7.15 (0.281")
Pixel Size: 1.25 x 1.30 (0.049" x 0.051")
Pixel Pitch: 1.30 x 1.35 (0.051" x 0.053")



* With LED backlight, total thickness changes from 11.0mm to 15.2mm (0.598"). Bezel height increases to 9.4mm (0.370") from 5.2mm.

Part Number	SIM81SLC	SIM81SLCLE4	SIM81SHW	SIM81SHWLE4
Operating Temperature °C	0 to +50	0 to +50	-20 to +70	-20 to +70
Storage Temperature °C	-20 to +60	-20 to +60	-30 to +80	-30 to +80
LED backlight current (@4.1V)	N/A	90mA typ. 180mA max.	N/A	90mA typ. 180mA max.

Alphanumeric dot matrix

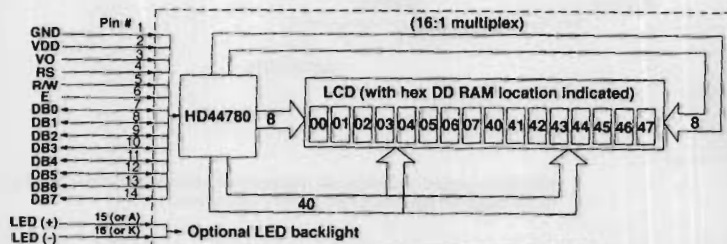
16 Characters x 1 Line

SIM161SLC

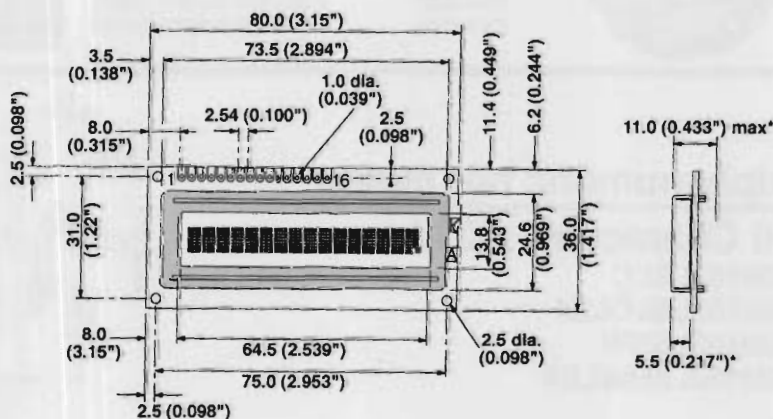
SIM161SLCLE4

SIM161SHW

SIM161SHWLE4



Character Format: 5 x 8
Character Size: 3.15 x 6.30 (0.124" X 0.248")
Character Pitch: 3.75 (0.148")
Pixel Size: 0.55 x 0.70 (0.022" X 0.028")
Pixel Pitch: 0.65 x 0.80 (0.026" X 0.031")



* With LED backlight, total thickness changes from 11.0mm to 13.7mm (0.539"). Bezel height increases to 8.2mm (0.323") from 5.5mm.

Part Number	SM161SLC	SIM161SLCLE4	SM161SHW	SIM161SHWLE4
Operating Temperature °C	0 to +50	0 to +50	-20 to +70	-20 to +70
Storage Temperature °C	-20 to +60	-20 to +60	-30 to +80	-30 to +80
LED backlight current (@4.1V)	N/A	100mA typ. 200mA max.	N/A	100mA typ. 200mA max.

Standard LCD modules



Alphanumeric dot matrix

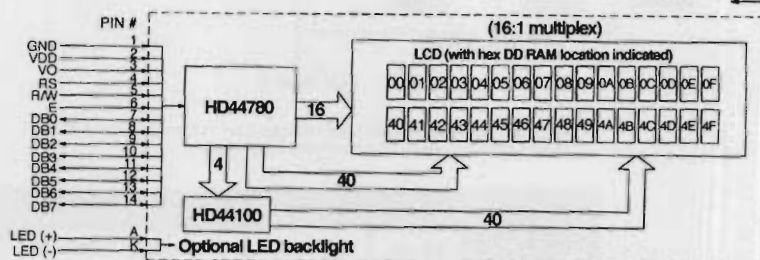
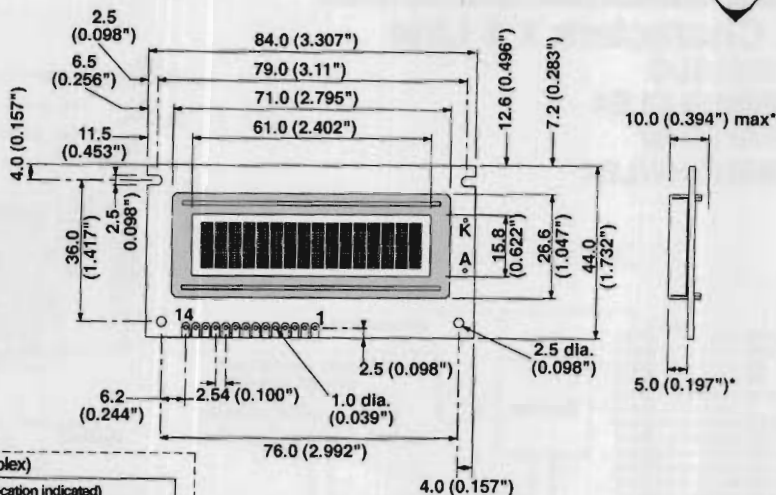
16 Characters x 2 Lines

SIM162SLC

SIM162SLCLE4

SIM162SHW

SIM162SHWLE4



* With LED backlight, total thickness changes from 10.0mm to 13.0mm (0.512"). Bezel height increases to 8.0mm (0.315") from 5.0mm.



Character Format: 5 x 8
Character Size: 2.95 x 5.55 (0.116" x 0.219")
Character Pitch: 3.55 x 5.95 (0.14" x 0.234")
Pixel Size: 0.55 x 0.65 (0.022" x 0.026")
Pixel Pitch: 0.60 x 0.70 (0.024" x 0.028")

Part Number	SIM162SLC	SIM162SLCLE4	SIM162SHW	SIM162SHWLE4
Operating Temperature °C	0 to +50	0 to +50	-20 to +70	-20 to +70
Storage Temperature °C	-20 to +60	-20 to +60	-30 to +80	-30 to +80
LED backlight current (@4.1V)	N/A	90mA typ. 180mA max.	N/A	90mA typ. 180mA max.

Alphanumeric dot matrix

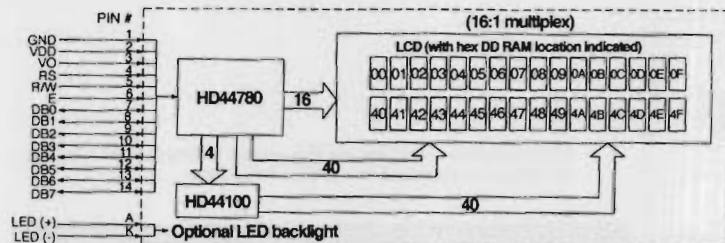
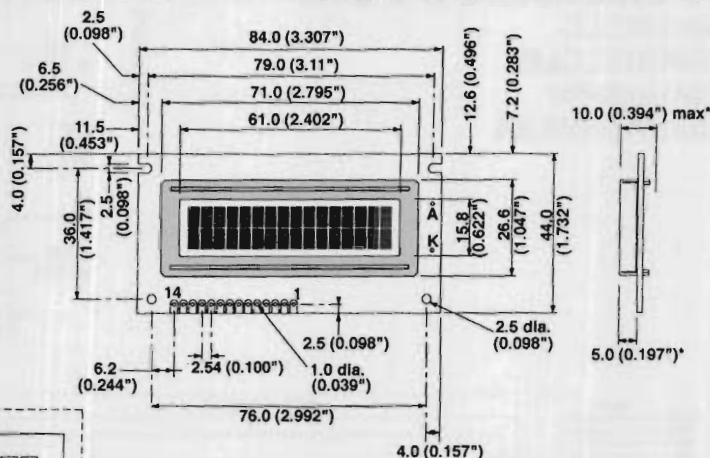
16 Characters x 2 Lines

SIM162LSLC

SIM162LSLCLE4

SIM162LSHW

SIM162LSHWLE4



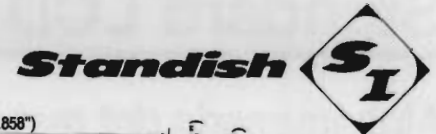
* With LED backlight, total thickness changes from 10.0mm to 13.0mm (0.512"). Bezel height increases to 8.0mm (0.315") from 5.0mm.

Character Format: 5 x 8
Character Size: 2.95 x 5.55 (0.116" x 0.219")
Character Pitch: 3.55 x 5.95 (0.14" x 0.234")
Pixel Size: 0.55 x 0.65 (0.022" x 0.026")
Pixel Pitch: 0.60 x 0.70 (0.024" x 0.028")

Part Number	SIM162LSLC	SIM162LSLCLE4	SIM162LSHW	SIM162LSHWLE4
Operating Temperature °C	0 to +50	0 to +50	-20 to +70	-20 to +70
Storage Temperature °C	-20 to +60	-20 to +60	-30 to +80	-30 to +80
LED backlight current (@4.1V)	N/A	90mA typ. 180mA max.	N/A	90mA typ. 180mA max.



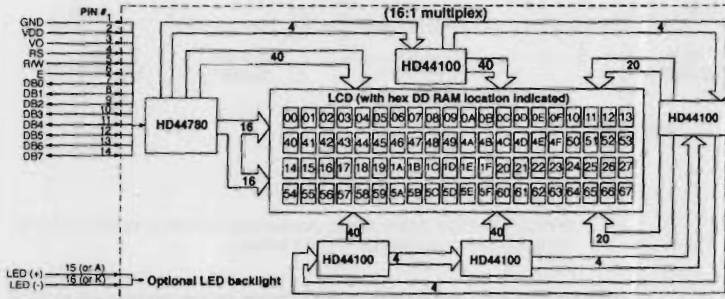
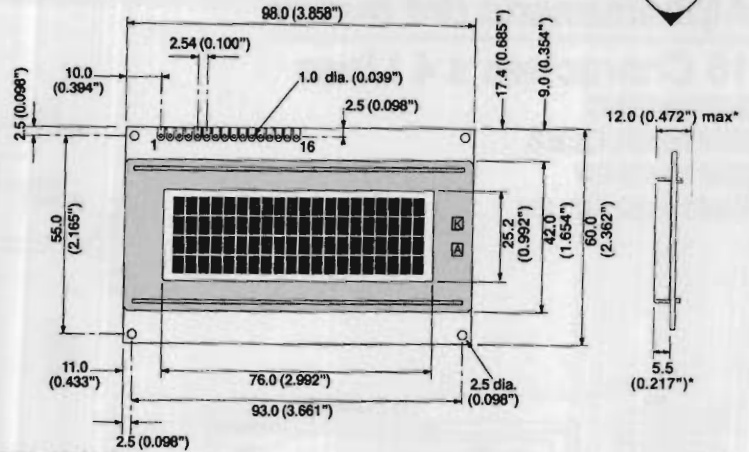
Standard LCD modules



Alphanumeric dot matrix

20 Characters x 4 Lines

SIM204SLC
SIM204SLCLE4
SIM204SHW
SIM204SHWLE4



* With LED backlight, total thickness changes from 12.0mm to 14.9mm (0.587"). Bezel height increases to 8.4mm (0.331") from 5.5mm.

Part Number	SIM204SLC	SIM204SLCLE4	SIM204SHW	SIM204SHWLE4
Operating Temperature °C	0 to +50	0 to +50	-20 to +70	-20 to +70
Storage Temperature °C	-20 to +60	-20 to +60	-30 to +80	-30 to +80
LED backlight current (@4.1V)	N/A	240mA typ. 480mA max.	N/A	240mA typ. 480mA max.

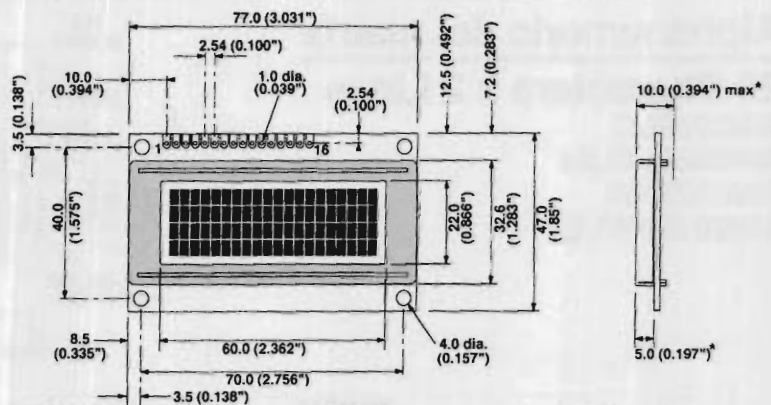


Character Format: 5 x 8
Character Size: 2.90 x 4.75 (0.114" x 0.187")
Character Pitch: 3.55 x 5.40 (0.14 x 0.213")
Pixel Size: 0.50 x 0.55 (0.02" x 0.022")
Pixel Pitch: 0.60 x 0.60 (0.024 x 0.024")

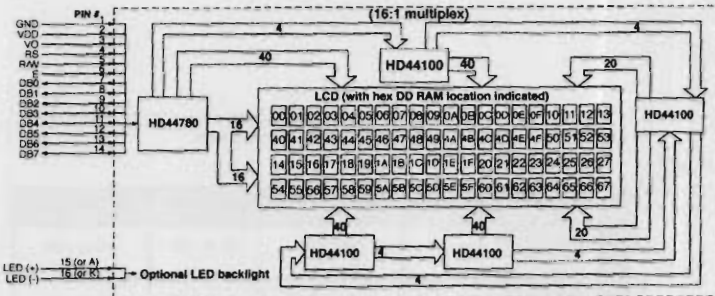
Alphanumeric dot matrix

20 Characters x 4 Lines

SIM204DSLCLC
SIM204DSLCLCLE4
SIM204DSHW
SIM204DSHWLE4



Note: Bezel length is 76.8mm (3.024") and is centered in the overall module length of 77.0mm.



* With LED backlight, total thickness changes from 10.0mm to 13.0mm (0.512"). Bezel height increases to 8.0mm (0.315") from 5.0mm.

Part Number	SIM204DSLCLC	SIM204DSLCLCLE4	SIM204DSHW	SIM204DSHWLE4
Operating Temperature °C	0 to +50	0 to +50	-20 to +70	-20 to +70
Storage Temperature °C	-20 to +60	-20 to +60	-30 to +80	-30 to +80
LED backlight current (@4.1V)	N/A	135mA typ. 270mA max.	N/A	135mA typ. 270mA max.

Character Format: 5 x 8
Character Size: 2.30 x 4.03 (0.091" x 0.159")
Character Pitch: 2.78 x 4.51 (0.109" x 0.178")
Pixel Size: 0.42 x 0.46 (0.017" x 0.018")
Pixel Pitch: 0.47 x 0.51 (0.019" x 0.020")

Standard LCD modules

Alphanumeric dot matrix

24 Characters x 2 Lines

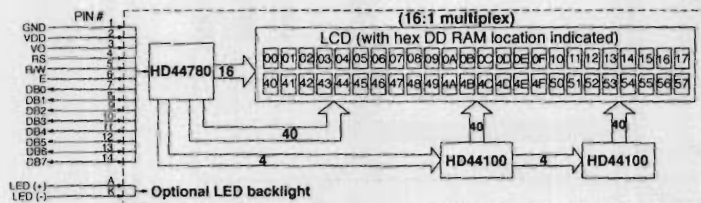
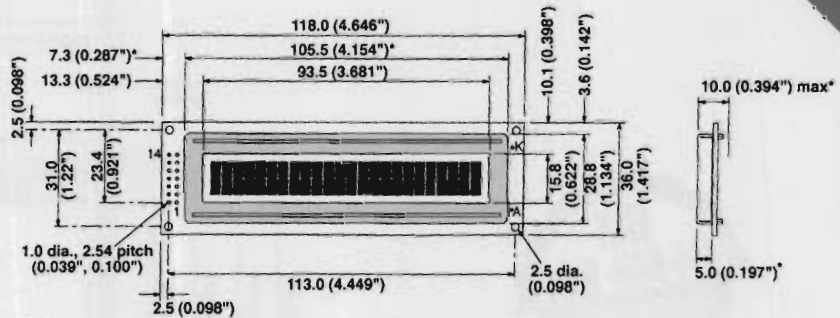
SIM242SLC

SIM242SLCLE4

SIM242SHW

SIM242SHWLE4

Standish



* With LED backlight, total thickness changes from 10.0mm to 13.4mm (0.528"). Bezel height increases to 8.4mm (0.331") from 5.0mm; bezel length increases to 108.5mm (4.272") from 105.5mm; and the bezel location reference dimension of 7.3mm is reduced to 5.75mm (0.226")



Character Format: 5 x 8
Character Size: 3.20 x 5.15 (0.126" x 0.203")
Character Pitch: 3.70 x 5.55 (0.146" x 0.219")
Pixel Size: 0.60 x 0.60 (0.024" x 0.024")
Pixel Pitch: 0.65 x 0.65 (0.026" x 0.026")

Part Number	SIM242SLC	SIM242SLCLE4	SIM242SHW	SIM242SHWLE4
Operating Temperature	0 to +50	0 to +50	-20 to +70	-20 to +70
Storage Temperature	-20 to +60	-20 to +60	-30 to +80	-30 to +80
LED backlight current (@4.1V)	N/A	140mA typ. 280mA max.	N/A	140mA typ. 280mA max.

Alphanumeric dot matrix

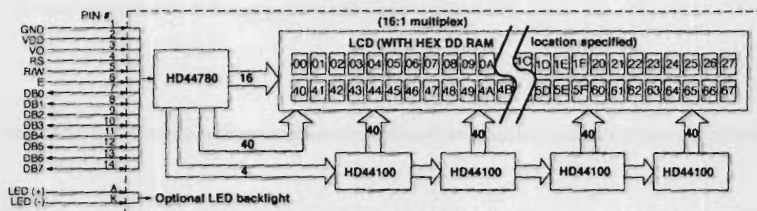
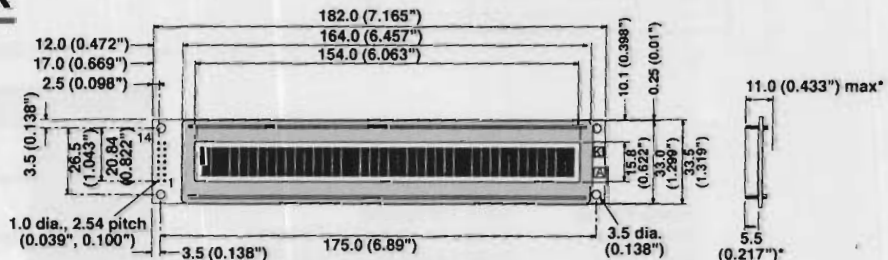
40 Characters x 2 Lines

SIM402SLC

SIM402SLCLE4

SIM402SHW

SIM402SHWLE4



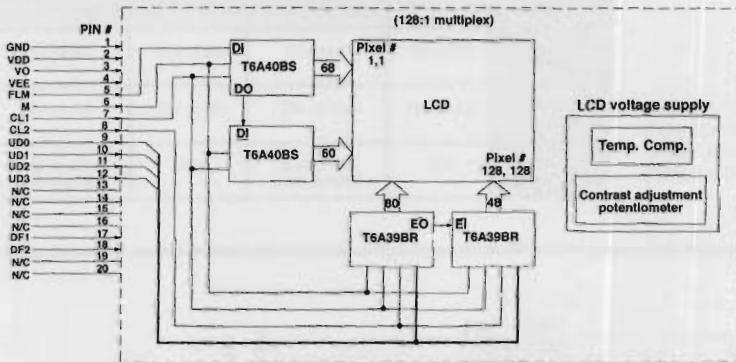
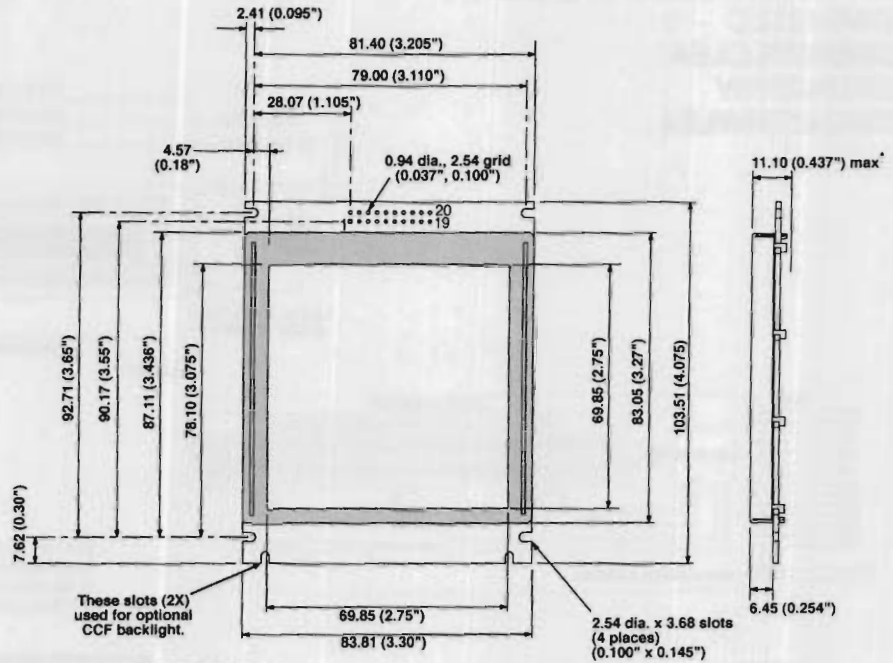
* With LED backlight, total thickness changes from 11.0mm to 14.9mm (0.587"). Bezel height increases to 9.4mm (0.37") from 5.5mm.

Character Format: 5 x 8
Character Size: 3.15 x 5.50 (0.124" x 0.217")
Character Pitch: 3.75 x 5.90 (0.148" x 0.232")
Pixel Size: 0.55 x 0.60 (0.022" x 0.024")
Pixel Pitch: 0.65 x 0.70 (0.026" x 0.028")

Part Number	SIM402SLC	SIM402SLCLE4	SIM402SHW	SIM402SHWLE4
Operating Temperature	0 to +50	0 to +50	-20 to +70	-20 to +70
Storage Temperature	-20 to +60	-20 to +60	-30 to +80	-30 to +80
LED backlight current (@4.1V)	N/A	340mA typ. 680mA max.	N/A	340mA typ. 680mA max.

Standard graphic LCD module

128 X 128



* Total package thickness may increase to 15.0 mm max. with LED backlight

Image Format: 128 x 128 Graphic
 Image Area: 64.95 x 64.95 (2.557" x 2.557")
 Pixel Size: 0.432 x 0.432 (0.017" x 0.017")
 Pixel Gap: 0.076 x 0.076 (0.003" x 0.003")
 Viewing Angle: 6-12 o'clock

Part Number	SISM-128X128	Options
Operating Temperature	-20 to +70	• LED, EL or CCF Backlight • HD61830B or T6963C controller with RAM* • DC-DC Converter for single 5V supply* • V_{LED} Adjustment* • Heater
Storage Temperature	-25 to +75	
Backlight type & Current	N/A	

*These options will be supplied on a daughter board that will attach to the main PCB.



Standard graphic LCD module

240 x 64

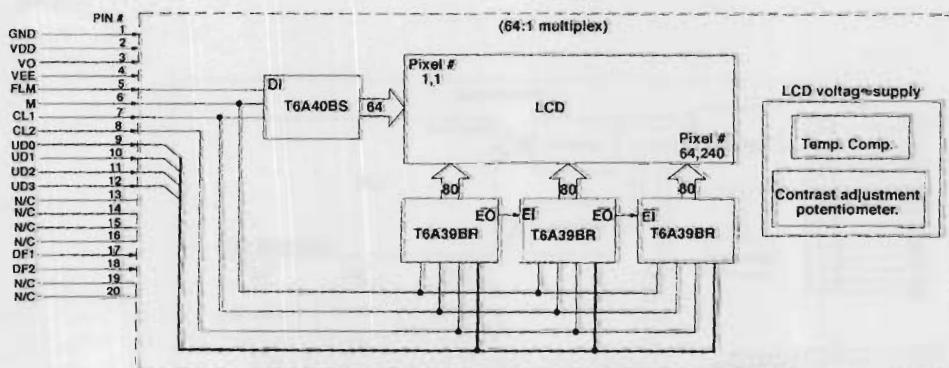
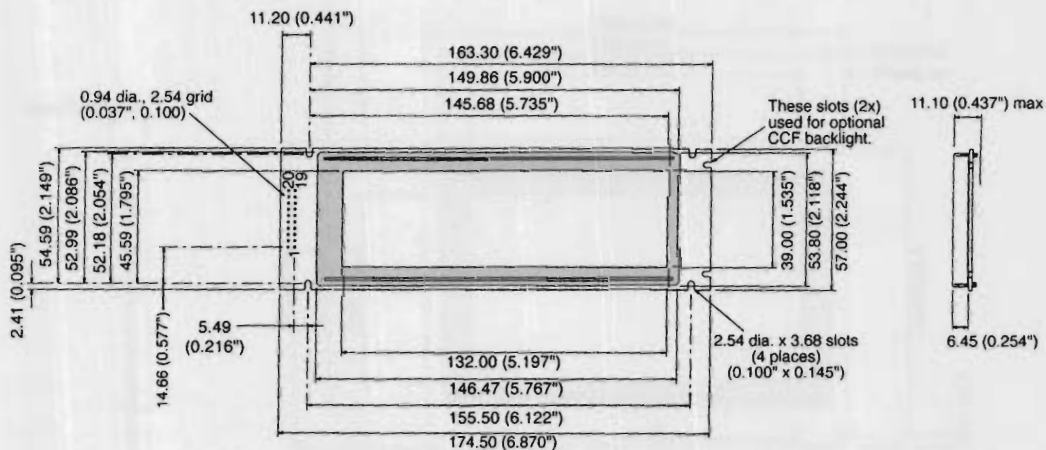


Image Format: 240 X 64 Graphic
 Image Area: 127.12 x 33.84 (5.0049" x 1.3325")*
 Pixel Size: ~0.45 x 0.45 (~0.018" x 0.018")*
 Pixel Gap: ~0.076 x 0.076 (~0.003" x 0.003")*
 Viewing Angle: 6-12 o'clock

* The image area specified is correct. Due to round off errors in metric-inch conversions, the pixel and gap dimensions have been approximated.

Part Number	SISM-240X64	Options
Operating Temperature °C	-20 to +70	• LED, EL or CCF Backlight
Storage Temperature °C	-25 to +75	• HD61830B or T6963C controller with RAM*
Backlight type and current	N/A	• DC-DC Converter for single 5V supply*
		• V _{CON} Adjustment*
		• Heater

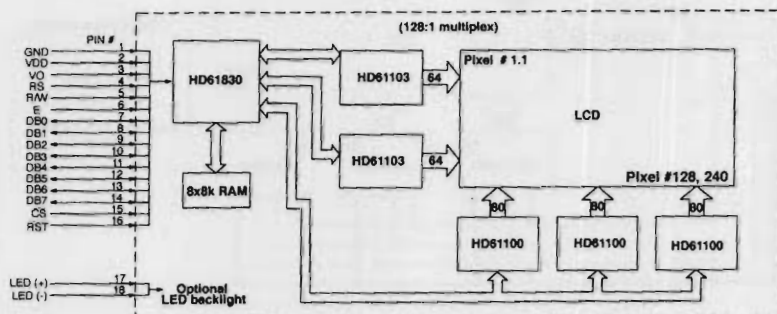
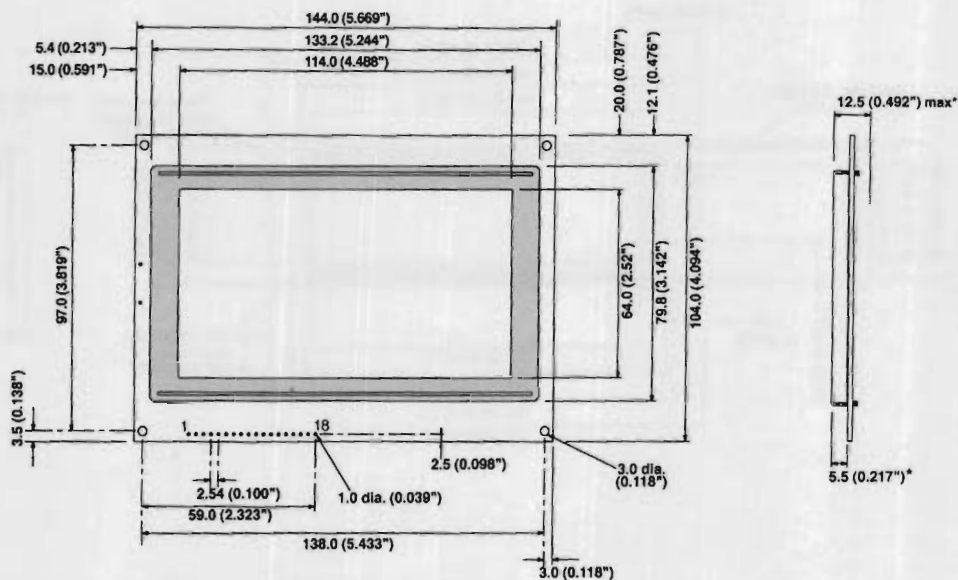
* These options will be supplied on a daughter board that will attach to the main PCB.



Standard graphic LCD module

240 x 128

SIM240128SHC
SIM240128SHCLE4



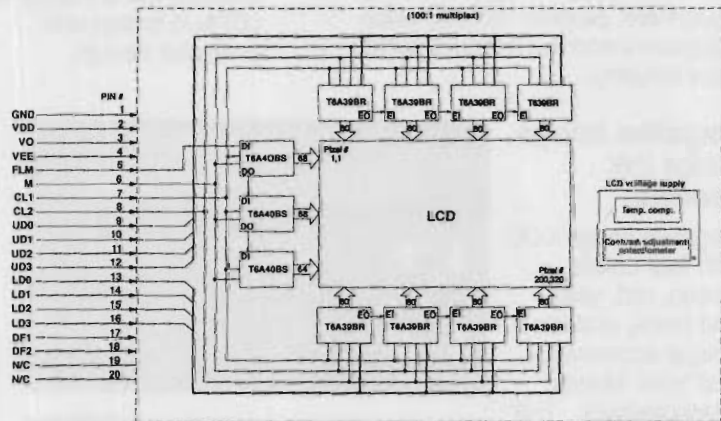
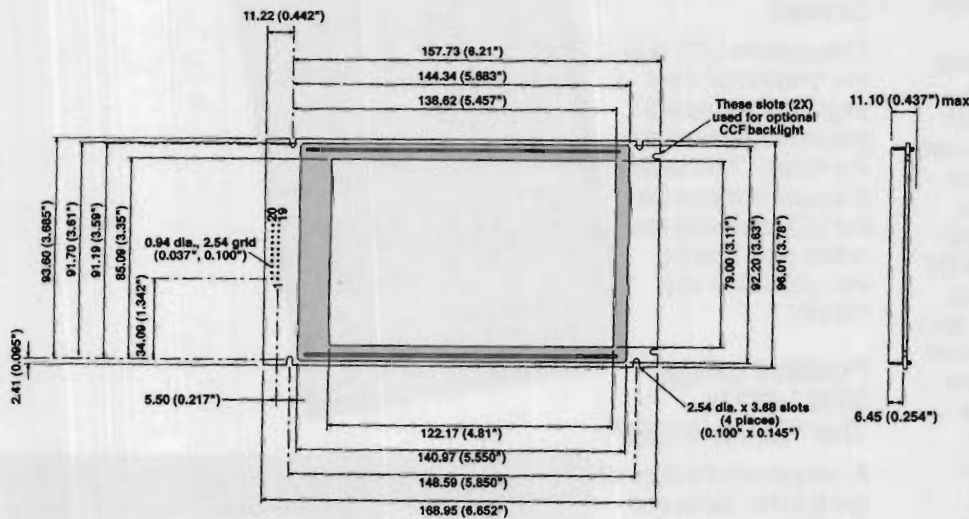
* With LED backlight, total thickness changes from 12.5mm to 15.0mm (0.591"). Bezel height increases to 8.0mm (0.315") from 5.5mm

Image Format: 240 x 128 Graphic
Image Area: 107.95 x 57.55 (4.25" x 2.266")
Pixel Size: 0.40 x 0.40 (~0.016" x 0.016")
Pixel Pitch: 0.05 x 0.05 (~0.002" x 0.002")
Viewing Angle: 6-12 o'clock

Part Number	SIM240128SHC	SIM240128SHCLE4
Operating Temperature °C	0 to +50	0 to +50
Storage Temperature °C	-20 to +60	-20 to +60
LED backlight current (@4.1V)	N/A	220mA typ. 440mA max.

Standard graphic LCD module

320x 200



Part Number	SISM-320X200	Options
Operating Temperature °C	-20 to +70	• LED, EL or CCF Backlight • HD61830B or T6963C controller with RAM*
Storage Temperature °C	-25 to +75	• DC-DC Converter for single 5V supply*
Backlight type and current	N/A	• H _{lco} Adjustment* • Heater

* These options will be supplied on a daughter board that will attach to the main PCB.

Image Format: 320 x 200 Graphic
 Image Area: 115.15 x 71.95 (4.5334" x 2.8327")*
 Pixel Size: ≈ 0.284 x 0.284 (≈ 0.011" x 0.011")*
 Pixel Gap: ≈ 0.076 x 0.076 (0.003" x 0.003")*
 Viewing Angle: 6-12 o'clock

* The image area specified is correct. Due to round off errors in metric - inch conversions, the pixel and gap dimensions have been approximated.



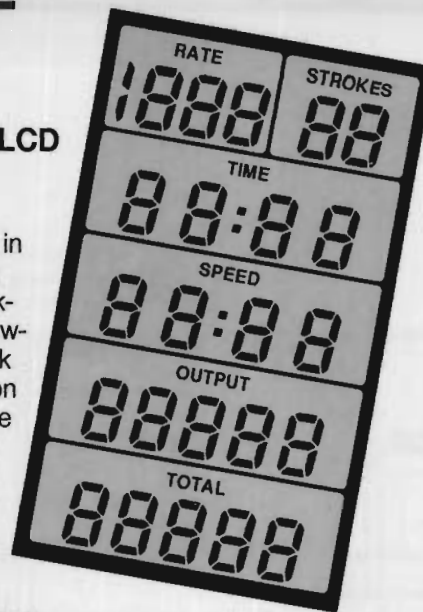
Custom LCD capability



Extensive research programs have provided Standish Industries with a leading edge position in the development of new liquid crystal display techniques. That technical expertise provides Standish with the unique ability to offer custom LCDs or LCD modules. (See pages 24-32). Proven methods of employing transmissive and transreflective color inks has fostered the development of back-lighted liquid crystal displays. TN or STN (supertwist) LCD types and options such as fluid type, viewing mode, terminal configurations, display size and glass shape make Standish custom LCDs suitable for applications in a wide variety of industries. Typical Standish custom LCD applications include; agrionic, avionic, medical instrumentation, marine, test equipment, military, petroleum handling equipment, process control, office equipment and the telecommunications industry.

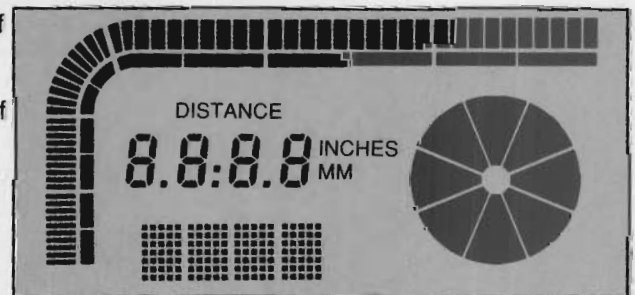
Positive Image LCD With Black Ink Screen

This custom LCD is in the "traditional" dark segments, light background reflective viewing mode. The black lines are screened on the LCD to divide the active area making the LCD more user friendly.



Positive Image STN LCD In The "Silver Mode"

A unique combination of bar graphs, digits and dot matrix characters illustrate the versatility of LCDs in format and character design.



Negative Image Color Ink Process

Negative image LCD with four colors (green, red, yellow and black) provide a unique appearance and "user friendly" characteristics. The LCD provides tire alignment position and status information to the operator.



Negative Image Color Ink Process

This copier status LCD features unique graphics, annunciators and digits combined with color inks to alert the operator to status changes, trouble areas and proper count. The white ink overlay creates an outline of the copier even when the LCD is not activated.



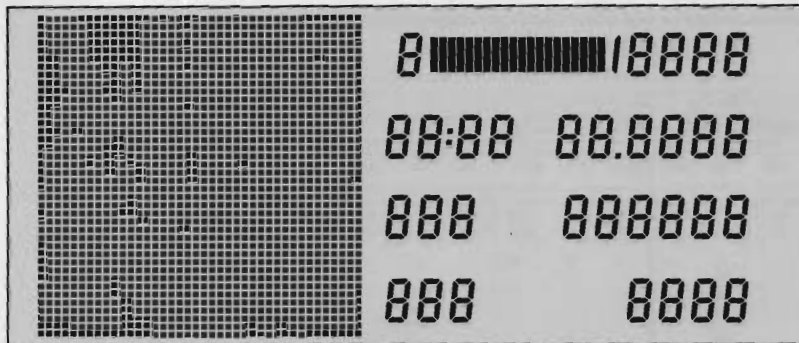
Positive Image TN Custom LCD

Numerous digits, a semi-circular bargraph and unique icons combine in this custom TN LCD to provide information to an "off-the-road" vehicle operator. A first minimum fluid was used in this design for an increased viewing angle, and as a secondary benefit, a wide operating temperature range.



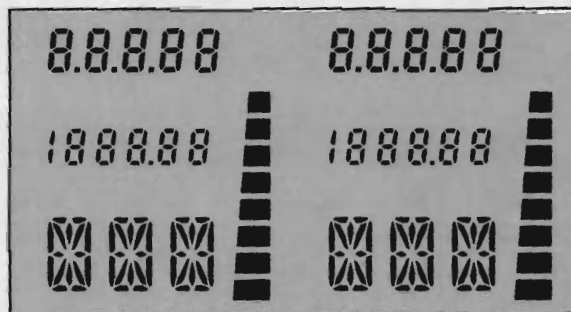
Custom Film Compensated STN (FSTN) LCD

Seven segment digits, a bargraph and a 40 x 40 graphics format combine in this versatile custom LCD design. FSTN LCD technology is used to achieve a "black on white" appearance.



Positive Image TN LCD in the Transflective Viewing Mode

Seven segment digits combined with two vertical bar graphs and sixteen segment alphanumeric characters make this design distinctive. The LCD is transfective for universal day and night use when backlit.



Standish



Negative Image Color Ink Process

Digits and annunciators combined with a multi-color format provides a quick and easy reference to the user and also adds appeal to the product. The LCD is backlit for low light/night use.



Supertwist (STN) Custom LCD

Segmented digits, bar graphs and dot matrix characters combine in a single LCD to provide a multi-purpose LCD design. This STN LCD combines two multiplex levels, 3:1 and 8:1 to achieve this multi-purpose format.



TN LCD fluid specifications



STANDARD TN FLUIDS

Fluid Type	H4184* Type "E" in P/N	H4337* Type "C" in P/N	H4646* Type "A" in P/N	H4651 Type "4" in P/N	UNITS
OPERATING TEMPERATURE STORAGE TEMPERATURE VLCD @ DRIVE RATES: DIRECT DRIVE 2:1 @ 1/2 Bias 3:1 @ 1/3 Bias 4:1 @ 1/3 Bias 8:1 @ 1/4 Bias 16:1 @ 1/5 Bias DC DRIVE ALLOWABLE OPERATING FREQUENCY V ₁₀ V ₉₀ dV/dT of V ₁₀ RESPONSE TIME (Static Drive): @ 20° C @ 0° C @ -20° C @ -30° C @ -40° C @ -55° C	MIN TYP MAX -55 +80 -55 +80 3 5 15 5.1 5.4 5.4 6.4 N/A 50 30 60 100 1.90 2.70 -9.1 on:15 / off:15 on:25 / off:45 on:130 / off:160 on:180 / off:170 on:470 / off:425 on:940 / off:1476	MIN TYP MAX -30 +85 -55 +85 4 5 15 7.2 7.7 7.7 N/A N/A 30 60 100 2.65 3.82 -7.0 on:50 / off:75 on:120 / off:150 on:390 / off:420 on:815 / off:840 on:N/A / off:N/A on:N/A / off:N/A	MIN TYP MAX -20 +80 -55 +80 3 5 15 4.7 5.0 5.0 N/A 50 30 60 100 1.76 2.57 -5.3 on:25 / off:65 on:70 / off:170 on:300 / off:900 on:N/A / off:N/A on:N/A / off:N/A on:N/A / off:N/A	MIN TYP MAX -20 +80 -55 +80 2 5 15 2.6 2.8 2.9 N/A 50 30 60 100 1.01 1.66 -3.4 on:25 / off:135 on:55 / off:465 on:300 / off:3700 on:N/A / off:N/A on:N/A / off:N/A on:N/A / off:N/A	°C °C Vrms Volts Volts Volts Volts mV Hz Vrms Vrms mV/°C msec msec msec msec msec

Fluid Type	H2799 Type "2" in P/N	H2870 Type "5" in P/N	H3482 Type "8" in P/N	H3527 Type "9" in P/N	H4137 Type "7" in P/N	UNITS
OPERATING TEMPERATURE STORAGE TEMPERATURE VLCD @ DRIVE RATES: DIRECT DRIVE 2:1 @ 1/2 Bias 3:1 @ 1/3 Bias 4:1 @ 1/3 Bias 8:1 @ 1/4 Bias 16:1 @ 1/5 Bias DC DRIVE ALLOWABLE OPERATING FREQUENCY V ₁₀ V ₉₀ dV/dT of V ₁₀ RESPONSE TIME (Static Drive): @ 20° C @ 0° C @ -20° C @ -30° C @ -40° C @ -55° C	MIN TYP MAX -30 +85 -55 +85 3 5 15 5.1 5.4 5.4 N/A N/A 30 60 100 1.90 2.90 -9.0 on:25 / off:50 on:60 / off:100 on:225 / off:400 on:350 / off:900 on:N/A / off:N/A on:N/A / off:N/A	MIN TYP MAX -10 +55 -55 +55 3 5 15 N/A N/A N/A N/A 50 30 60 100 1.22 2.01 N/A on:35 / off:115 on:125 / off:395 on:N/A / off:N/A on:N/A / off:N/A on:N/A / off:N/A	MIN TYP MAX -40 +85 -55 +85 3 5 15 4.7 5.0 5.0 6.0 7.7 50 30 60 100 1.76 2.53 -6.0 on:25 / off:50 on:55 / off:110 on:190 / off:450 on:300 / off:1200 on>4000 / off>4000 on:N/A / off:N/A	MIN TYP MAX -30 +80 -55 +80 3 5 15 3.9 4.1 4.4 N/A N/A 50 30 60 100 2.36 2.36 -7.1 on:25 / off:65 on:55 / off:140 on:175 / off:550 on:275 / off:1550 on:N/A / off:N/A on:N/A / off:N/A	MIN TYP MAX -40 +105 -55 +105 4 5 15 5.7 6.0 6.3 N/A N/A 50 30 60 100 2.10 3.62 -9.0 on:40 / off:45 on:105 / off:100 on:360 / off:390 on:N/A / off:N/A on:1195 / off:3355 on:N/A / off:N/A	°C °C Vrms Volts Volts Volts Volts mV Hz Vrms Vrms mV/°C msec msec msec msec msec

All specifications are based on 20°C, directly driven (5Vrms @ 60 Hz) unless otherwise specified.
High Stability Polarizer(s) are rated to +80°.
Drive method may affect operating temperature range.
N/A = Not Available/Not Applicable.

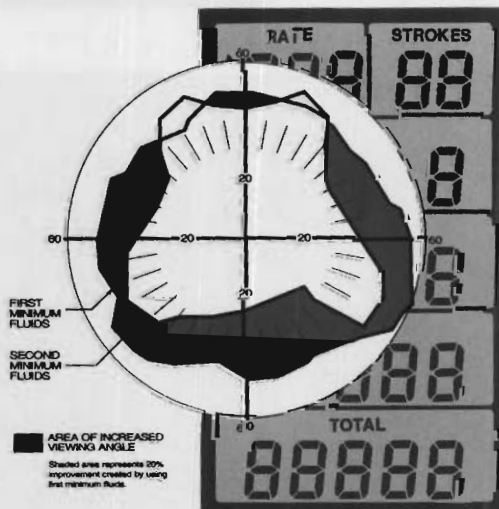
*These are "First Minimum" fluids.

The TN fluids listed above are available in both custom LCD designs and the standard LCDs on Pages 7 - 13.

Isocontrast Plot Comparing First and Second Minimum fluids

A selection of three first minimum fluids (see above) are available for LCD applications requiring increased off axis viewing and/or the elimination of nulls in the viewing cone when backlighting.

As demonstrated in the isocontrast plot at the right, first minimum LCDs typically provide a 20 percent increase in the LCD viewing cone when compared to other non-first minimum LCDs. Contact Standish's Applications Engineering for details.



TN FLUID CHARACTERISTICS

H4184 (E): A first minimum fluid offering exceptional viewing angle characteristics, a typical response time of less than 2 seconds at -55°C (Static Drive).

H4337 (C): A wide viewing angle fluid enhanced by first minimum LCD cell construction techniques, suitable for many "out-door" applications.

H4646 (A): A first minimum fluid offering a wide operating and storage temperature, the lowest voltage first minimum fluid available.

H4651 (4): A low voltage fluid suitable for static drive or moderate multiplex levels, a V₁₀ of 1.01 Vrms, makes it the lowest voltage fluid listed.

H2799 (2): -30 to +85°C operating temperature, second minimum fluid, enhanced speed of response at low temperatures, thousands of LCDs in use with this fluid.

H2870 (5): Our most economical fluid, static drive only, intended for use in "commercial" applications.

H3482 (8): A low viscosity fluid with an operating temperature of -40 to +80°C, one of the best TN multiplex fluids available (up to 16:1 max.) Many LCDs in use with this fluid.

H3527 (9): A low voltage multiplex fluid (V₁₀ = 1.47 Vrms), operating temperature range of -30 to +80°C.

H4137 (7): A fluid with an extreme operating temperature of -40 to +105°C, the only fluid we have seen listed with an upper operating temperature of +105°C.



STN LCD fluid specifications

Standish 



Reverse Image,
Film Compensated
STN LCD Custom Module



Positive Image
Custom STN LCD

STN FLUID CHARACTERISTICS

SD: This fluid functions well over a wide temperature range, has slow response times and is useful for medium level multiplex applications.

SE: This material operates well over a medium temperature range, has medium response times, and similarly, has medium level multiplex capabilities.

SF: This material functions over a wide temperature range, has fast response times, and can accommodate high level multiplex applications.

SG: This fluid is suited for indoor applications. It operates over medium temperature range, has fast response times, and can be used for high level multiplex applications.

SH: This fluid has the widest temperature operating range of any of the fluids, as well as fast response times and medium to high level multiplex capabilities.

SI: This material is ideal for low voltage applications. It functions over a medium temperature range, has fast response times, and has low to medium level multiplex capabilities.

STANDARD 240° SUPERTWIST FLUIDS

Fluid Type	SD			SE			SF			UNITS
OPERATING TEMPERATURE STORAGE TEMPERATURE VLCD @ DRIVE RATES: 16:1 @ 1/5 Bias 32:1 @ 1/7 Bias 64:1 @ 1/9 Bias 128:1 @ 1/12 Bias 240:1 @ 1/16 Bias V ₁₀ V ₉₀ DC DRIVE ALLOWABLE OPERATING FREQUENCY	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
	-20 -30		+75 +80	-10 -30		+60 +70	-20 -30		+75 +80	
		9.3			8.6			9.6		°C
		12.8			11.5			13.2		°C
		16.4			15.0			17.0		Volts
		22.2			20.3			22.9		Volts
		29.7			27.1			30.6		Volts
		2.51			2.28			2.59		Vrms
		2.64			2.43			2.72		Vrms
	30		50	30		50	30		50	mV
			250			250			250	Hz

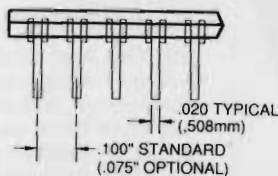
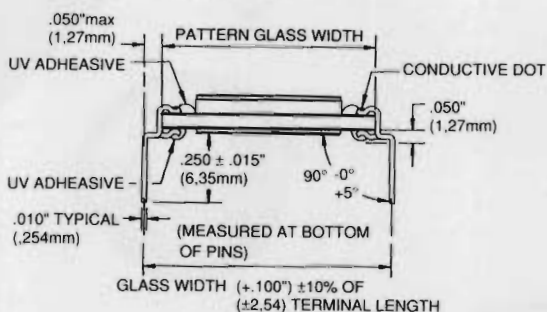
Fluid Type	SG			SH			SI			UNITS
OPERATING TEMPERATURE STORAGE TEMPERATURE VLCD @ DRIVE RATES: 16:1 @ 1/5 Bias 32:1 @ 1/7 Bias 64:1 @ 1/9 Bias 128:1 @ 1/12 Bias 240:1 @ 1/16 Bias V ₁₀ V ₉₀ DC DRIVE ALLOWABLE OPERATING FREQUENCY	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
	-20 -30		+50 +60	-20 -30		+100 +100	-20 -30		+60 +70	
		9.6			9.3			5.0		°C
		13.4			13.4			6.7		°C
		17.3			16.3			8.8		Volts
		23.5			22.1			N/A		Volts
		31.0			29.5			N/A		Volts
		2.65			2.48			1.30		Vrms
		2.73			2.64			1.47		Vrms
	30		50	30		50	30		50	mV
			250			250			250	Hz

All readings are taken at 20°C, unless otherwise specified.
High stability polarizers are rated to +80°C.
N/A = Not Available/Not Applicable.

**New Enhanced Supertwist (ESTN) materials are being developed.
See Page 34 for more information.**

Connection methods for custom LCD designs

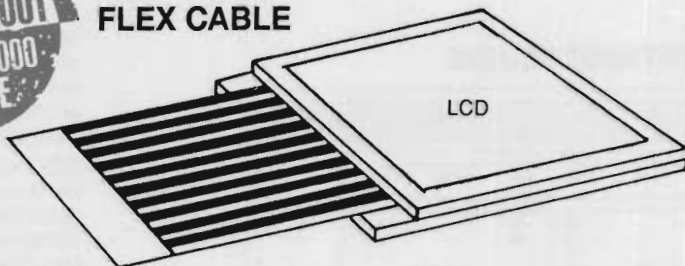
SIL/DIL PINS



Other pin length options available.



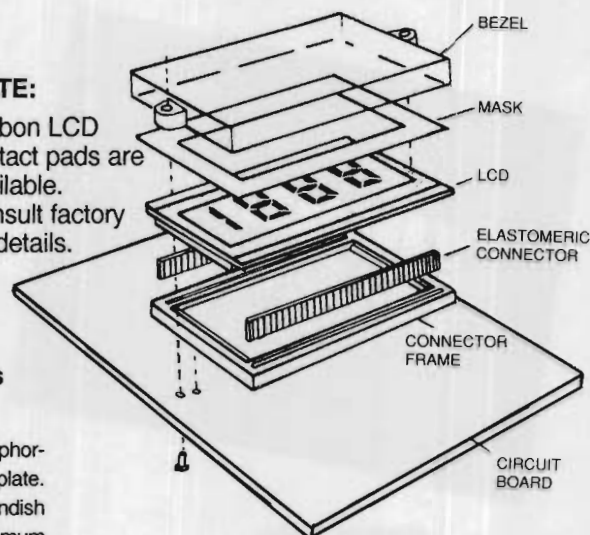
HEAT SEAL FLEX CABLE



ELASTOMERIC CONNECTOR

NOTE:

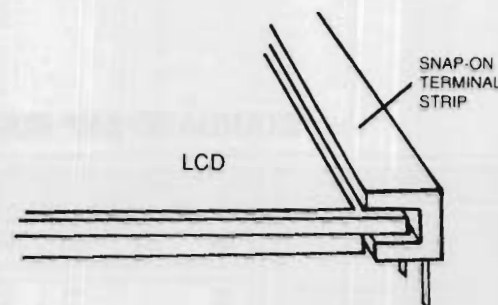
Carbon LCD contact pads are available. Consult factory for details.



SOLDERING OF LCDs WITH TERMINALS

Terminals are constructed of phosphor-bronze with a 0.001" 60/40 tin plate. When wave soldering LCDs, Standish suggests 300°C, 5 seconds maximum and Freon TF cleaning solution. The maximum temperature the LCD proper reaches should not exceed the maximum rated storage temperature of the device. The terminals themselves may, of course, exceed that temperature.

SNAP ON CONNECTOR



LCD Glass and Module Viewing Mode Option



TN options



Positive image 313, 363, 315, 365 black on "silver"



Positive image 333 green on "silver"



Positive image 353 blue on "silver"



Negative image 415, 465, 260 silver/clear on dark



Negative image 453 silver on blue



Negative image 443 silver on red

STN options



Positive image neutralized "silver mode"



Positive image normal STN



Positive image film compensated "black on white"



Negative image neutralized "silver mode"



Negative image normal STN



Negative image film compensated "white on black"

Products & Specifications can change without further notice.

Custom LCD design sheet



Standish offers complete design and prototype services as well as low to high volume production capabilities for custom displays. Due to the flexibility inherent in LCD technology and Standish's manufacturing process, custom formats can normally be incorporated with no addition in piece price. Custom displays are subject to a one-time engineering/artwork charge, plus an optional prototype charge.

For a complete cost and engineering analysis, complete this design sheet and submit it to your nearest Standish Sales Representative or to Standish LCD,

Application Engineering Department,
W7514 Highway V,
Lake Mills, WI 53551



LCD REQUEST FOR QUOTATION FORM

Please fax your specifications to Standish LCD, **Attention:** Applications Dept.

Company _____ Contacts Name _____
Address _____ City, State, Zip _____
Phone _____ Fax _____

Application: _____
Quantity Estimates: _____ Yearly
Target Production Date: _____

Interest: ☐ Immediate
☐ Long Range
☐ Budgetary

Dimensions are in: (and are to be given X axis first)
☐ Inches
☐ Millimeters

Viewing Area: _____
("A") _____ x ("B") _____
("G" is typically 0.125", consult factory for options.)
☐ Approximate Size ☐ Maximum Size
☐ Selected by Standish

Contact Ledge(s):
How Many _____

Width ("C") _____
(0.05" min., 0.10" typ).

Operating Temp: _____ to _____ °C.

Storage Temp: _____ to _____ °C.

Viewing Mode:
☐ Reflective
☐ Transflective
☐ Transmissive
☐ Added Colors (if any): _____

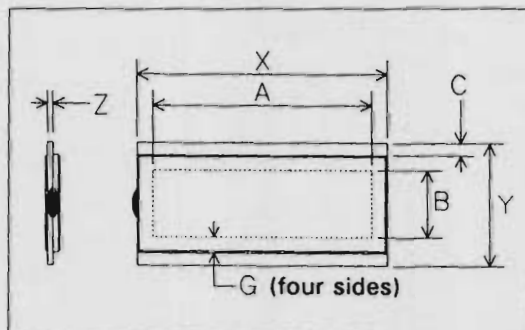
Viewing Angle:
☐ 12:00
☐ 6:00
☐ Other: _____

Connection:
☐ Pins
☐ 0.100" Pitch ☐ 0.075" Pitch
☐ Elastomers
☐ Flex Cable
☐ Other _____

Drive, if known:
☐ Static (Direct), _____ V_{RMS}
☐ Multiplex, _____:1 mux, 1/_____ bias
V_{LCD}: _____
☐ Driver: _____

Glass Size:
("X") _____ x ("Y") _____

Glass Plate Thickness:
_____ ("Z")
(typically 0.043")



Provide any additional information regarding your application that might assist us. Please send a sketch or drawing that, at a minimum, describes the LCD image.

Custom LCD module capability



Custom LCD modules used in fuel management system

Two custom LCD modules manufactured by Standish industries are used in a fuel management system.

One of the LCD modules is a "pump status display" featuring user friendly icons/symbols that allow the station attendant or operator to monitor the various pumps at a glance. The other is a 2 x 40 dot matrix character module that allows the system to function as a cash register in addition to a fuel management system.



Digital demultiplexer uses custom LCD module

A 240 x 64 STN LCD module manufactured by Standish Industries is used in a digital demultiplexer.

The 240 x 64 custom dot matrix graphic STN LCD module features a temperature compensation circuit and a "double-edge" LED backlight. The 240 x 64 LCD format allows either character (8 x 40) or graphic information presentation.



OPTIONS

- Antiglare polarizers
- Antireflective coatings
- Heaters
- On-board temperature sensors
- Temperature compensation circuits
- Contrast adjustment
- Conformal coatings
- Color
- Hardcoat polarizers



1 Backlight Option

- LED (light emitting diode)
- EL (electroluminescent)
- Fiberoptic
- Standish Slimline CCF (cold cathode fluorescent)
- Incandescent
- Halogen

2 Viewing Mode Options

- Reflective
- Transflective
- Transmissive
- Negative image
- Positive image
- Colors

3 Display Images

- Numeric
- Alphanumeric
- Graphic
- Icons/ annunciators messages/ symbols

5 Fluid Options

Our research services group tests all of the newest fluids, assuring you the best technology available in both our standard lines and our custom designs.

We know when to use an economical fluid (commercial applications, for example) or a wide storage and operating range fluid (military, outdoor) or a first minimum fluid for a wider viewing angle (medical, petrol pump).

If your requirements include fast response times (avionics), we offer the appropriate fluid. Or if you have a high level multiplex requirement (common to many industrial applications), we know what works best. Our expertise extends to fluid options for TN LCDs driven to 16 level multiplex, STN LCDs to 240, and even the latest, wide temperature ESTN LCDs.

4 Connection Methods

- SIL/DIL pins
- Heat seal flex cable
- Edge board connectors
- Elastomeric

LCD Types

- TN (twisted nematic)
- ESTN enhanced super twisted nematic)
- STN (super twisted nematic)
- Dichroic

LCD Sizes

- Up to 13.2" x 13.6" (335 x 335 mm)



Custom LCD module used in private aircraft

A custom 64 x 64 LCD module is used to present thunderstorm weather information.

This module, in addition to a 64 x 64 graphic LCD, includes a temperature compensation circuit and an EL backlight.



Custom module design sheet



Standish offers complete design and prototype services as well as low to high volume production capabilities for custom LCD modules. Custom LCD modules consist of a front panel bezel, liquid crystal display, drivers and circuit board. All components have been selected specifically for compatibility with your particular custom liquid crystal display. Custom modules are subject to a one-time tooling charge.

For a complete cost and engineering analysis, complete this design sheet and submit it to your nearest Standish Sales Representative or to Standish LCD,

Application Engineering Department,
W7514 Highway V,
Lake Mills, WI 53551



LCD MODULE REQUEST FOR QUOTATION FORM

Please fax your specifications to Standish LCD, **Attention:** Applications Dept.

Company _____ Contacts Name _____
Address _____ City, State, Zip _____
Phone _____ Fax _____

Application: _____
Quantity Estimates: _____ Yearly
Target Production Date: _____

Interest: ☐ Immediate
☐ Long Range
☐ Budgetary

Dimensions are in: (and are to be given X axis first.)
☐ Inches
☐ Millimeters

Overall Module Size:
☐ _____ x _____ x _____
☐ Approximate Size ☐ Maximum Size
☐ Selected by Standish

Viewing Area of LCD:
☐ _____ x _____
☐ Approximate Size ☐ Maximum Size
☐ Selected by Standish

External Connection to the PCB:
☐ Selected by Standish
☐ Plated through holes
☐ Header ☐ Straight pin
☐ Right Angle
☐ Other _____

Operating Temp: _____ to _____ °C.

Storage Temp: _____ to _____ °C.

Color(s): ☐ Standish to suggest
☐ Segments: _____
background: _____

Viewing Angle:
☐ 12:00
☐ 6:00
☐ Other: _____

Drive method:

- ☐ Selected by Standish
☐ Static (Direct)
☐ Multiplex, _____: 1 mux, 1/_____ bias,

Driver(s):

- ☐ _____
☐ Selected by Standish

Backlighting:

- ☐ NOT required
☐ Standish to suggest type
☐ LED } Color: _____
☐ EL, }
☐ CCF
☐ Other: _____

Logic Input:

- ☐ Parallel, _____ Bit
☐ Serial
☐ Analog
☐ Selected by Standish

Available Voltage:

- ☐ +_____ V DC; -_____ V DC
☐ _____ V AC (for backlight)

Temp. Comp:

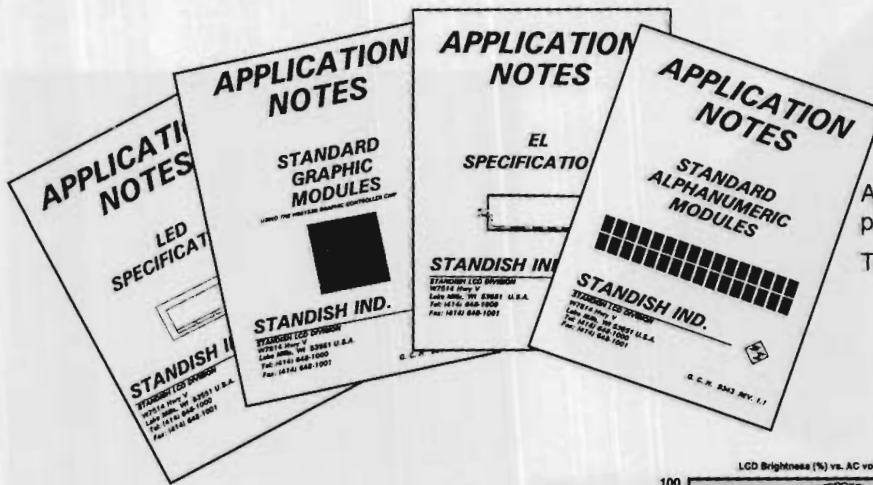
- ☐ Requested
☐ Selected by Standish

Contrast Adjustment:

- ☐ Requested
☐ Selected by Standish

Provide any additional information regarding your application that might assist us. Please send a sketch or drawing that, at a minimum, describes the LCD image.

Additional Technical Information Available from Standish



Application notes for our standard module product offering are available.

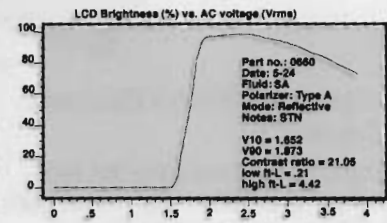
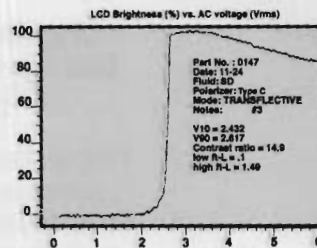
Topics discussed include:

Alphanumeric modules

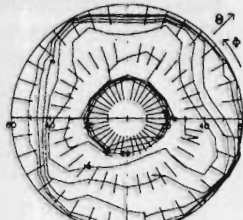
Graphic modules

EL backlight and LED backlight specifications.

Brightness versus voltage curves are available for all TN and STN fluids and polarizer combinations listed in this catalog. Curves are also available for other standard or custom LCD glass or module designs.

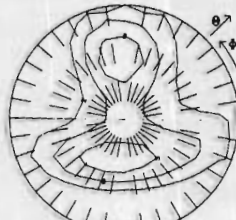


LCD Isocontrast Plot



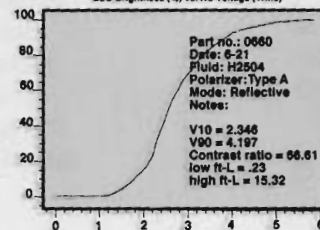
File no. 0893-002 Static Drive

LCD Isocontrast Plot

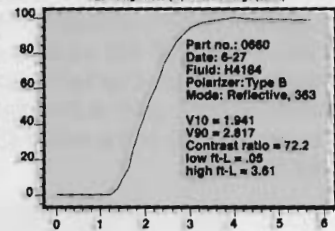


File no. 0893-006 4:1 Mux 1/3 Bias

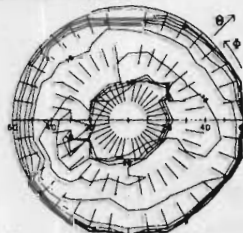
LCD Brightness (%) vs. AC voltage (Vrms)



LCD Brightness (%) vs. AC voltage (Vrms)

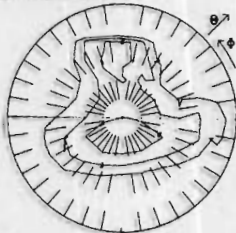


LCD Isocontrast Plot



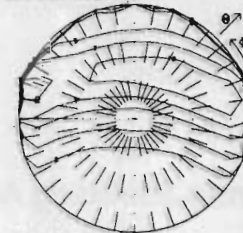
File no. 0893-001 Static Drive

LCD Isocontrast Plot



File no. 0893-003 4:1 Mux 1/3 Bias

LCD Isocontrast Plot



File no. 0893-007 4:1 Mux 1/3 Bias

Isocontrast plots depict the contrast ratio and viewing angle of the measured LCD cell. The contrast and the viewing angle of an LCD used in your application is critical to the visual success of your product. Standish has developed test cells that duplicate the various fluids, polarizers and drive options available to aid in the selection of the appropriate material combination to help provide the best appearing LCD possible.

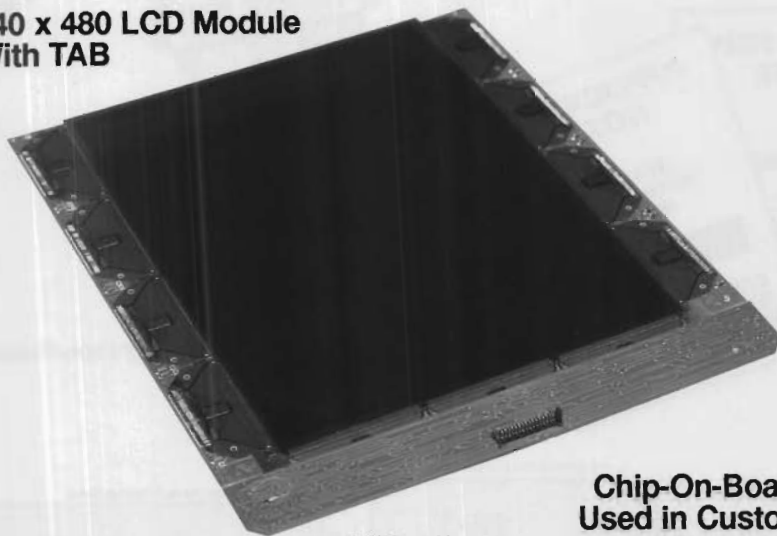


Contact Standish's application engineering department to discuss, or request information on, your LCD application.

Technology Preview



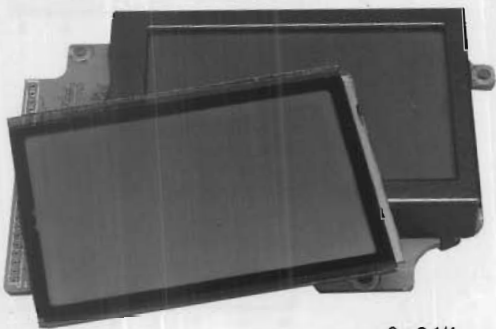
640 x 480 LCD Module With TAB



9 5/16 x 7 3/4

High Resolution Graphic Capability

Standish is developing the technology to produce high resolution LCDs as demonstrated by this 640 x 480 STN monochrome LCD module. Full color development is expected to be completed in late 1995. [Note that this module also incorporates another technology advancement: tape automated bonding (TAB) of the driver ICs to flex circuits.]



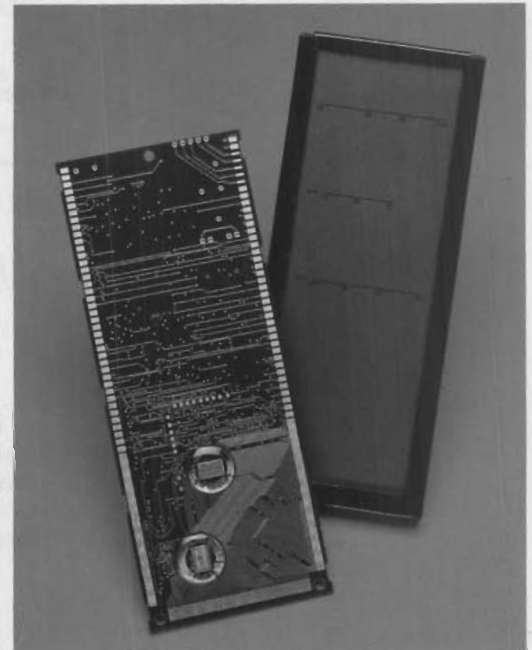
3 x 2 1/4

Enhanced Supertwist (ESTN) LCD

This custom LCD module features Standish-developed ESTN technology. ESTN LCDs have similar characteristics (wide viewing angle and high rate of multiplex) to traditional STN LCDs, but have a much wider operate and storage temperature range. Contact Standish's Application Engineering for more details.

Chip-On-Board Used in Custom LCD Module

Chip-on-Board (COB) technology is used in those custom module applications requiring extreme miniaturization of the module package. It provides an overall footprint that is one-fourth the size of surface mount technologies.



Chip-On-Board LCD Module

ICs "glob topped." (Note: The glob top is clear for photography purposes).

2 1/4 x 2 7/8

- Touch Screens
- "Slim" CCF backlight
- Heaters
- Dynamic Addressing Schemes (Including Active Addressing™) "Motif, Inc.



Please contact the Standish Application Engineering Department for more information on any of the above or for help with your LCD application.

Terms & Definitions



ACTIVE MATRIX, AMTFT — Thin film transistors deposited onto the LCD glass substrate control each pixel or dot. The pixels then become "static drive" segments featuring excellent contrast and viewing characteristics. Applications are typically in highly populated graphic type panels.

ANNUNCIATOR — Typically a word or symbol with a dedicated meaning, located within the LCD image area.

ARRAY PROCESS — A method of manufacture where sheets of glass consisting of several displays are assembled, the displays are isolated and filled with the liquid crystal material after assembly of the larger sheets (see also Endfill).

BACKPLANE — The typical name used for common electrodes in static drive or low multiplexed rate LCDs.

CELL, LCD — The area between the two glass plates; the area containing the liquid crystal material.

COB — (Chip on Board) - A method of wire bonding an integrated circuit (die) directly to the PCB.

COLUMN — A vertical arrangement of LCD segments, as in a vertical line of dots in a graphic LCD. Also, a name often used for the segment connections in dot matrix graphic or alphanumeric LCDs.

COMMON — An LCD is created by two electrodes. The common electrode is typically used by several segment connections.

COMMON PLATE — The glass plate having the back plane common, or row electrode(s).

CONTACT LEDGE — The extended area where electrical connection is made to the LCD, typically an extension of the pattern plate.

CONTRAST RATIO — The ratio of the luminance in the light state to that of the dark state.

DIL — Dual in line; an LCD having two parallel contact ledges.

DIRECT DRIVE — See Static Drive.

ELASTOMERIC CONNECTORS — A type of flexible, conductive material sometimes used for electrical connection to an LCD.

ENDFILL, EF — A method of manufacture where the liquid crystal material is introduced to an assembled cell by means of an opening in the seal; vacuum fill (see also Array process).

ESTN — (Enhanced STN) - An extended temperature range STN LCD with a slightly different cell construction.

FERROELECTRIC, FLC — A type of liquid crystal possessing a permanent dipole. Devices made from these materials exhibit bistability, fast switching and high contrast. Current applications in shuttering and light manipulation.

FIRST MINIMUM — A TN LCD using low birefringence fluid and select cell spacing to achieve a very wide viewing angle with no nulls in the viewing cone. Best results are achieved when the LCD is positive image and static drive.

FONT — The style of character or digit.

FSTN — (Film Compensated STN) - A STN LCD with an extra film added to the outside of the cell to compensate the color shift of blue on green to black on white.

GHOSTING — A condition where areas of the display which should be off are slightly visible.

GLASS ONLY — A phrase used to indicate the completed LCD proper, without backlights, drive electronics, et cetera. Not a module.

GUEST-HOST DICHOIC — A type of liquid crystal material or display consisting of a "host" fluid containing a color dye "guest".

HEAT SEAL CONNECTOR — A thin flexible polyester substrate with conductive traces used to make an interconnection between an LCD and PCB.

IMAGE AREA — The area which encompasses the actual display image (for reference, see viewing area).

INK OVERLAY, INK UNDERLAY, INK PROCESS — A process of printing opaque, transmissive or transreflective inks on an LCD for the purpose of adding color or reducing the number of active areas in the display.

INTERNAL COLOR FILTER(s) — A process of printing a color or colors internal to the LCD cell to achieve a color display.

ISO CONTRAST PLOT — A plot that shows contrast ratio versus viewing angle. Curves on the plot connect points of equal contrast.

LCF, LXF — See Liquid Crystal Fluid.

LIQUID CRYSTAL — An organic compound which, over a specified temperature range, exhibits characteristics of both liquid and crystalline materials.

MODULE, LCD — Terminology typically used to describe an assembly of LCD glass, PCB, drivers, bezel, backlight, etc.

MULTIPLEX, MUX — A method of addressing individual segments having common segment connections, but differing back planes (see also application notes).

NEGATIVE IMAGE — An LCD where the active areas are lighter than the background (silver on black, silver on red, etc.).

PATTERN PLATE — The glass plate having the segment connections.

PIN-OUT — The identification of which conductive pad or pin (terminal) connects to which segment(s).

PIXEL — An active segment; typically any dot in a dot matrix LCD.

POLARIZER — A stretched polymer containing dyes that transmits light in one axis. Standard TN and STN LCDs require two polarizers located on the outside of the common and pattern plates.

POSITIVE IMAGE — An LCD where the active areas are darker than the background (black on silver, blue on silver, etc.).

REFLECTIVE (Polarizer) — A type of backing which is only capable of reflecting light received from the front, such as ambient light.

ROW — A horizontal arrangement of LCD segments, as in a horizontal line of dots in a graphic LCD. Also, a name often used for the common electrodes in dot matrix graphic or alphanumeric LCDs.

SIL — Single in line; an LCD having a single contact ledge.

SEGMENT — An active area in the image area.

SEGMENT CONNECTION (or drive line) — The electrode used to address one segment per common electrode.

STATIC DRIVE — A method of activating an LCD where each segment has an independent connection.

SUPERTWIST, STN — A type of LCD that offers superior viewing angles and contrast when the multiplex level is >16:1. Molecular twist angle is usually between 180° to 270° versus 90° for TN LCDs, thereby the name Supertwist.

TAB (Tape Automated Bonding) — A method of interconnecting a TCP to a LCD and/or PCB.

TCP (Tape Carrier Package) — An encapsulated integrated circuit bonded to a flexible substrate.

THIRD CONTACT LEDGE — An "offset" contact ledge typically used for the common connections on a greater than 16 level multiplex LCD.

TRANSFLECTIVE (Polarizer) — A type of backing which allows light to pass through from the back, as well as reflect light from the front.

TRANSMISSIVE — A type of LCD which has no reflective or transreflective back material; this type of display must be lit from the back.

TWISTED NEMATIC, TN — A type of liquid crystal whose molecular alignment is spiral; at rest, in any plane the molecules are parallel and adjacent planes are parallel.

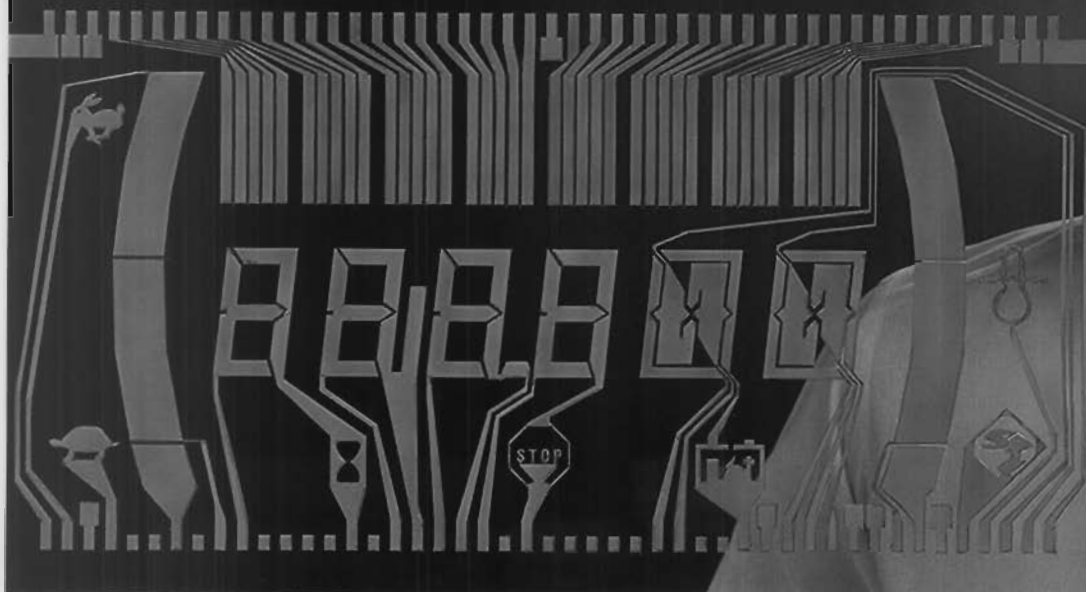
VIEWING AREA — The area of an LCD which is viewable through a bezel; typically at least 0.025" greater in any direction than the image area.

V10 (Vth) — The RMS voltage that drives the liquid crystal molecules to 10% of full activation.

V90 (Vsat) — The RMS voltage that drives the liquid crystal molecules to 90% of full activation.

VLCD — The dc voltage required by the LCD controller/driver to power the LCD. This is also known as contrast adjustment.

INNOVATIVE LCD TECHNOLOGY PROVIDES CREATIVE DISPLAY SOLUTIONS



Standish LCD is an innovative manufacturer of LCD products. From one of the world's largest selection of "off-the-shelf" standard product lines to the most unique custom designs, Standish is able to support your LCD requirements.

Standish believes in, and recognizes that, quality of product, quality of service, and quality of commitment is critically important to their customers.

Standish's commitment not only includes advanced CAD systems and the most modern manufacturing facilities but a complete understanding of all facets of LCD technology.

Some Reasons to Work With Standish on Your Next LCD Design:

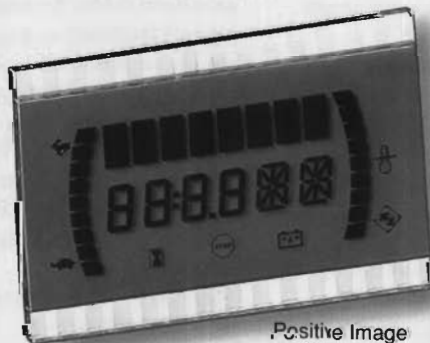
1. Our highly-rated Customer Service Group makes it easy for you to work with us from initial contact through product delivery.
2. Our responsive Applications Engineering Group will help sort through the complexities of viewing modes, display image, glass, fluids, and other components so you receive the best LCD technology for your application.
3. Our experienced CAD Design Group provides full support for your specialized needs, with detailed drawings and precise specifications.

4. Our methodical and thorough Quality Assurance Group uses the latest statistical and testing techniques to maintain product reliability and integrity.

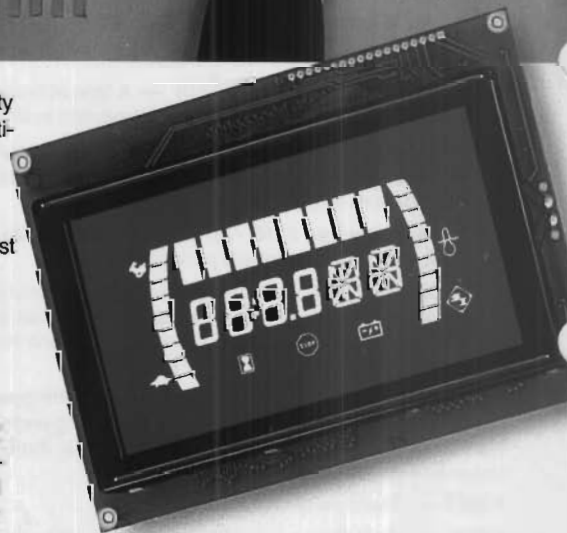
5. Our leading edge Technology and Research Group investigates the newest materials, components, and technologies so that our LCD products always meet your expectations, today and tomorrow.

For More Information:

Please contact your factory trained and LCD experienced Standish sales representative, distributor or agent. They will provide complete information about our standard LCDs or modules, or provide the assistance needed to create your unique custom design.



Positive Image
STN LCD



Reverse Image,
Film Compensated
STN LCD



Standish LCD

Division of Standish Industries, Inc.

W7514 Highway V
Lake Mills, WI 53551 U.S.A.
Phone: 414/648-1000
Fax: 414/648-1001